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The Nolanaceae are a very natural group of more or less succulent herbs and small shrubs characteristic of the coastal districts of northern Chile and southern Peru. They are evidently related to the Solanaceae from which they differ in the nature and structures of their remarkable fruit. This bony fruit, basically pentamerous, is schizocarpic or consists of three to numerous one- to eight-seeded nutlets that are uniseriate or pluriseriate in superimposed series. The last complete enumeration of the species was by Dunal in 1852, who (treating the group as a subtribe of the Solanaceae) recognized 33 species distributed among 5 genera. This work was prepared, however, when the coastal deserts of northern Chile and southern Peru, which we now know to contain the majority of the Nolanaceae, were almost unknown botanically. It was not until the publication of the extensive but unorganized and overly enthusiastic work of Philippi, between 1860 and 1895, that the variety and number of the Chilean species were appreciated. The Peruvian species have remained very imperfectly known. Until recently very little concerning them had been added to the few observations made by Ruiz and Pavon in 1799.

Only three families, the Boraginaceae, Convolvulaceae and Solanaceae, have been suggested as possible relatives of the Nolanaceae. The possibility of direct relation between the Nolanaceae and the Boraginaceae needs no serious consideration, for it is based upon the most superficial of resemblances in the fruiting structures. The closest relations are evidently with the Solanaceae. This affinity, emphasized by such workers as Miers, Dunal, Eichler, Baillon, Solereder, Wettstein and Hallier, is shown by agreements between the families in a host of minor and major details of anatomy and morphology involving all parts of the plant. On the other hand, in the general appearance of the corollas of some Nolanaceae and in the pentamerous nature of the fruit, Endlicher, Bentham and Hooker, and recently, Hutchinson, have not only seen evidences of relationship with the Convolvulaceae but reasons actually for subordinating our family under it. It is necessary, therefore, to discuss these characters of the corolla and fruit of the Nolanaceae which have been taken as indicative of a close relationship with the Convolvulaceae, to interpret them and to balance them against the similarities in anatomy, secretions, indument, sympody, recaulescence, gamosepaly, sepal-aestiva-

tion, gross habit, etc., etc., which have been emphasized by those who see the Nolanaceae as related to the Solanaceae.

The corollas of the Nolanaceae are plicate, regularly and somewhat cochleately so, and in aestivation, therefore, stand about equally close to conditions observable in both Solanaceae and Convolvulaceae. The large blue corollas of some Nolanaceae, and especially those that have reached European gardens, superficially suggest those of some Convolvulaceae. However, these also resemble the corollas of such genera of the Solanaceae as *Petunia* and, what is more, the small corollas of the shrubby species of *Nolana*, which are very different from any in the Convolvulaceae, are very much like those of *Fabiana*, *Lycium*, etc. of the Solanaceae. In fact the corollas of the Nolanaceae, in appearance, size, form, color and texture, evidently fall well within the range of corolla-variation exhibited by the South American Solanaceae. The corollas of most Nolanaceae, on the other hand, are quite different in appearance from any observable in the Convolvulaceae. The flowers of the Nolanaceae, furthermore, show tendencies toward zygomorphy, as evidenced by the more or less unequal calyx-lobes, the occasionally cleft calyx, the constantly unequal (3 long and 2 short) stamens, and the occasional obscurely 2-lipped corollas. These are familiar features in the Solanaceae but not in the Convolvulaceae. Indeed, a careful study of the corolla and stamens throughout the Nolanaceae, far from revealing structures and conditions indicative of the relations of the family in the Convolvulaceae, actually make that supposed affinity seem more improbable and the relationship with the Solanaceae, suggested by similarities in the calyx, inflorescence and vegetative parts, seem so very probable as to approach certainty.

The ovary in the Nolanaceae is pentamerous. This is the common (though not the universal) condition in the Convolvulaceae. Upon the fact of this agreement between the Nolanaceae and the Convolvulaceae, those who argue for the supposed immediate relation between these two families, must make their stand. In the Solanaceae the ovary is prevailingly dimerous, the notable single exception being the 5-celled baccate fruit of the Peruvian *Nicandra*. However, since with the best of reasons the Tetracyclicae are all assumed to have had ancestory with a pentamerous ovary, the pentamery of the ovary in the Nolanaceae may well be considered as the persistence of a generally primitive condition or as a reversion to it. This reasoning is accepted in retaining *Nicandra* in the Solanaceae. Hence, I can not feel that this pentamery in the Nolanaceae must necessarily indicate relation-

ship in the Convolvulaceae, nor that it is a bar to direct relations in the Solanaceae.

Some importance has been placed on the fact that the ovules of the Nolanaceae and Convolvulaceae agree in their basal attachment and thus differ from those of the Solanaceae which are axial. In reply to this it must be noted, however, that in the number of ovules and in the structure of the embryo the Nolanaceae agree much more closely with the Solanaceae. Furthermore their basal attachment may well be the direct, we may even add, the inevitable, result of evolutionary changes that have ended in the development of the nutlet-type of fruit in the Nolanaceae.

The fruit of the Nolanaceae has developed, I believe, from a many-seeded berry in which the carpial and placental tissue has become united and hardened into a bony mass and lobed into nutlets each containing one or more embedded seeds. The most primitive fruit is that of *Alona* where the style is terminal and seated in the pericarp and the parts of the schizocarp are typically several- to many-seeded and broadly joined to the receptacle and to one another into a rounded mass. In *Nolana* the fruit becomes lobed, the style becomes attached to the receptacle, and the nutlets become free from one another. In its simple form, as in *N. humifusa*, the fruit of *Nolana* is composed of 5, large, several-seeded, crowded, angular nutlets which are broadly attached to the receptacle. In the shrubby species of *Nolana*, on the other hand, the fruit is reduced to 5, well spaced, globose or ovoid, basally attached, single-seeded nutlets. In such herbaceous species of *Nolana*, as *N. paradoxa*, *N. baccata* and *N. Gayana*, the nutlets exhibit another kind of simplification. Here the nutlets of the type of *N. humifusa* have undergone tangential lobing. One or more seeds have been cut off from the broad multispermous mass of the original nutlet and 2 or more concentric ranks of small, few-seeded nutlets formed.

The remarkable fact about the Nolanaceous fruit is the number and scattered arrangement of the seeds, each in a special cavity and each directly attached to the receptacle, that may be present in each of the nutlets. This is particularly evident in the schizocarpic fruit of *Alona*, which, as indicated, is primitive in its terminal style and its rounded unlobed fruit with continuous pericarp. It seems evident that fruit of the Nolanaceae must have developed from a multispermous berry, which became sclerified and schizocarpic and finally lobed. Accompanying this the axial placenta became reduced and finally receptacular. Certainly it could not have had a drupaceous origin as

have had the fruits of the Boraginaceae, Verbenaceae and Labiatae. Nor can it have developed from the fruit of the Convolvulaceae which is prevailingly dry and capsular, with false septa, biovulate carpels, large seeds, and broad folded cotyledons. The more I have observed and considered the fruit of the Nolanaceae, the stronger has become my belief that it must be a specialized derivative of the multispermous Solanaceous berry.

The Convolvulaceae of southern and western South America are all of the conventional type and do not have the habit nor any peculiar characters suggestive of the Nolanaceae. On the other hand, in and about the very region in which the Nolanaceae abound there is a great display of the Solanaceae, of the most diverse types, many of them with berries and suggestive of the Nolanaceae in a wealth of uncommon floral and vegetative details. In fruit, particularly, these Solanaceae show several significant developments. There are the dry berries in genera such as *Phrodus*. There are various degrees of sclerification observable in the baccate fruits of *Lycium* and *Grabowskia*. And most interestingly there is the berry of *Nicandra*, the one example of pentamerous fruit in the Solanaceae. These modifications of the typical Solanaceous berry are suggestive of a possible combination of tendencies that could have produced the Nolanaceous fruit. Significantly they occur in species from within an area that not only constitutes a great evolutionary center of the Solanaceae, but one which geographically embraces the range of the Nolanaceae as well. The fruit of the Nolanaceae, in agreement with all floral and vegetative characters, is not indicative of affinity with the Convolvulaceae, but is indicative, rather, of a direct origin in the Solanaceae.

Among those who have seriously considered the relationship of the Nolanaceae, within the past half century, Hutchinson alone has placed the relations of the family outside the Solanaceae. Hutchinson followed Bentham and Hooker in treating our family as a part of the Convolvulaceae but gave no reasons for so doing. However, when the relationships of the Nolanaceae have been discussed by special students of the Convolvulaceae (Hallier) or the Solanaceae (Miers, Dunal and Wettstein), these particularly qualified men have uniformly insisted on the close relationship between the Solanaceae and Nolanaceae. Hallier, Bot. Jahrb. **16:** 561 (1893), after a detailed systematic and morphological study of the Convolvulaceae, was most positive in his exclusion of the Nolanaceae from any direct relation with the Convolvulaceae. According to him the relations of our family are clearly

with the Solanaceae, just as stated by the monographers of that latter family. With this I fully agree. My study of the Nolanaceae has convinced me that they are evidently related to the Solanaceae and are an extreme product of that evolutionary activity in the Solanaceae which has produced the multiplicity of genera and species of that family in western and southern South America. The relationships are so close that the Nolanaceae might even be treated as a well marked group subordinate to the Solanaceae.

The Nolanaceae are practically confined to the coastal regions of northern Chile and southern Peru, between the ports of Valparaiso and Lima. In the Valparaiso region there are four species, *N. rupicola*, *N. paradoxa*, *N. crassulifolia* and *N. sedifolia*. To the south of this region only one species is present, the littoral *N. paradoxa*, which reaches Chilean Patagonia and sets the extreme southern limit of the family in lat. 45° S. North of the region about Valparaiso the species rapidly increase in number in the provinces of Coquimbo (10 spp.), Atacama (19 spp.) and Antofagasta (22 spp.). The provinces of Atacama and Antofagasta together have 28 of the total 63 species of the entire family and so constitute the larger of the two principal centers of the Nolanaceae. Tarapacá, the province of Chile north of Antofagasta, has only 5 species (3 of these endemic) all obviously related to the southward. As is well known, the coastal flora of western South America changes very abruptly near the Chile-Peruvian boundary. This is evident in our family. Of all its numerous species on the Chilean littoral only *N. Jaffuelii* extends into Peru. The three southernmost departments of Peru have the second important center of the Nolanaceae. These departments have a total of 18 species of which 6 occur in Tacna, 2 in Moquegua and 12 in Arequipa. All of these departments, and particularly Moquegua, are in great need of further botanizing. From them will come most of the future additions to the family. North of the department of Arequipa the number of species again decreases. In the poorly explored department of Ica there are 2 known species, *N. Weberbaueri* and *N. insularis*. There are 4 species (*N. humifusa*, *N. Gayana*, *N. inflata* and *N. laxa*) known from the department of Lima. The northern limit of the family on the continent is set by *N. humifusa*, in lat. 11° 30′ S., on the coast a few kilometers north of Lima and by *N. laxa*, in lat. 11° 20′ S., in the interior at Canta to the northeast of Lima. The outlying *N. galapagensis*, of the southern Galapagos Islands, sets the extreme northern limit for the family just south of the Equator.

Generally speaking the species of Nolanaceae tend to be of restricted

distribution. Many are apparently local and most of the remainder range along less than 500 km. of coast. The few exceptions are *N. paradoxa* (over a 1000 km.), *N. sedifolia* (over a 1000 km.), *N. acuminata* (nearly a 1000 km.) and *N. rupicola* (nearly 800 km.). Of these exceptions, the first two seem to be homogeneous species. *Nolana acuminata* and *N. rupicola*, however, are polymorphous and not well understood. They will probably prove to consist of a number of critical forms of limited distribution.

The Nolanaceae are plants of well drained sands and gravels. The great majority of species occur at low altitudes, well below 1000 m. alt., and well within 75 km. of the coast, and many of them on coastal plains or slopes within sight of the ocean. Only a few species, however, seem to affect the rocky shores or beaches under the direct influence of ocean spray. These littoral plants, *N. paradoxa, N. thinophila, N. crassulifolia, N. galapagensis* and possibly *Alona carnosa*, show the only halophytic tendencies in the family. Contrary to statements found in various books this is not a family of halophytes. It is one of the most characteristic elements of that remarkable vernal vegetation of western Peru and northern Chile, the Loma Formation, which owes its existence to the beneficent effects of the sea-fogs that drift landward during the spring months and bring a little moisture and humidity to this nearly rainless region. Only a few Nolanaceae seem to occur beyond the direct influence of the coastal fogs. *Nolana villosa* grows on the parched crests of the coastal hills above the level of fogs and in the very arid regions behind the coastal hills impassable to them. *Nolana leptophylla* also occurs on the hot dry crests of the coastal hills above the fog and at altitudes between 1000 and 3000 meters along the base of the cordilleras 50–125 km. inland. *Nolana tarapacana* and *N. foliosa* occur about 100 km. inland, the former at 1400 m. alt. and the latter above 2000 m. alt. Unique is the case of *N. flaccida* which extends from the coastal plain at sea-level, inland 125 km. to around 3000 m. alt., from within the fog-belt to well beyond it.

In Peru, as in Chile, most of the Nolanaceae occur near the coast but in the southern departments, where there are only low coastal hills or simply a rolling sweeping ascent towards the cordilleras, the fogs tend to have their maximum effects further inland. Here we have *N. confinis* 30–125 km. inland and at 500 to 4000 m. alt., *N. platyphylla* 50 km. inland and at about 1500 m. alt., and *N. gracillima* 20–60 km. inland and between 600 and 2000 m. alt. Further north in Peru two species occur, not in the well developed Loma Formation

of the coastal hills, but beyond these hills and an intervening desert in a belt of spring rains along the base of the cordilleras. These species, *N. laxa* and *N. Weberbaueri*, one to the northeast and the other to the southeast of Lima, occur nearly 100 km. inland at altitudes between 1000 and 1500 meters. As in Chile, however, most of the species in Peru range in the region along the coast and at low altitudes.

It is to be noted that no species are reported from Bolivia. There are a few references and the labels of some specimens that might indicate the presence of the Nolanaceae within that country, but these, I believe, are either incorrect or date from the period when Tarapacá, now Chilean, was a part of Bolivia. Recently a member of the Nolanaceae has been reported from Argentina by Molfino, Physis 8: 117–118 (1925). The record is based upon a flowering specimen from a saline lake in the territory of Los Andes that was thought to suggest "*Dolia clavata*" and "*D. divaricata.*" The saline habitat of the plant, the high altitudes of Los Andes, and the lack of fruiting structures make me doubt this record. I suspect it is based, either upon mislabeled specimens, or upon misleading incomplete material of some other family, probably Solanaceae, incorrectly identified.

As in many other natural families, the species of Nolanaceae offer a perplexing problem in generic classification. They are, generally speaking, readily recognized and defined. Evident differences in habit, indument, glandularity, leaf-shape, flower-size, fruit-structure, etc., permit the ready recognition of most of them upon gross aspect alone. They occupy natural, though generally limited ranges and have their relatives present in adjacent or somewhat distant areas along the coast. Though these species are surprisingly diverse and well marked they do not fall into any groupings that are convincingly natural and monophyletic. The relationships within the family seem to interlock in a confused reticular system. Diverse types of habit, various types of corolla, numerous modifications of the fruit, etc., are associated in a great variety of combinations suggestive of the interlacing relationship. This is particularly evident in several of the striking developments, such as the cleft calyx or the complex stellate or dendritic hairs. These developments appearing only in a highly elaborated form and erratically through the family, have evolutionary lines, as evidenced by a morphological series of increasing complexity, which show little tendency to parallel those of the other structures on the plant.

Early in the course of the work on the Nolanaceae it became clear

that though the species could be readily defined and recognized, the natural groups of them were singularly ill-defined and elusive. This paper was left uncompleted for over a year and a half after an unsatisfactory first struggle with the generic problem. I have since returned to that problem at various times and have not only seriously considered placing all the species of the Nolanaceae into a single genus, but also of distributing them into many genera as well. I am finally of the belief that unless one wishes to sponsor a disproportionate number of not overly convincing monotypic or ditypic genera and even submit to the fair challenge of being artificial also, one must either place all the Nolanaceae into the single genus, *Nolana*, or divide the species very unequally between *Nolana* and *Alona* on what seems to be a decisive and fundamental structure of fruit alone.

The genus *Alona* is distinguished from *Nolana* only by characters of fruit. With much justification it could be treated as merely a section or subgenus of *Nolana*. However, since the Nolanaceae represent a departure from the Solanaceae in which a special type of fruit has developed and since the schizocarpic fruit of *Alona* seems evidently less evolved than the nutlet-fruit of *Nolana*, the differences between the two genera, involving structures that justify the very recognition of the family, seem to be important enough, especially since they are clear-cut and decisive, to warrant the use of them in generic separation. Except for the fruit, however, there are no other differences between the two genera. All species of *Alona* are shrubs with narrow leaves. Most of them are glabrous with a rather glutinous or resinous epidermis. In this they are approximated most closely by *Nolana thinophila*. Two of the species are glandular pubescent and not at all resinous. Among the species of *Nolana*, two species, *N. flaccida* and *N. mollis*, much suggest *Alona* in general appearance and flowers.

The genus *Nolana* contains 57 of the total 63 recognized species of the Nolanaceae. For the 57 species there has been published 14 genera typified by 11 different species. Most of these genera, however, were published when only a fraction of the number of species now recognized was known.

The fruit of *Nolana*, differing from *Alona*, consists of distinct, free nutlets, and from species to species exhibits a completely intergrading series of remarkable elaborations. Though several of the extremes in fruit development are so very striking that it is not at all surprising that genera have been based upon them, a study of the fruits of all the species reveals so very many transitional types that the use of

fruit in dividing *Nolana* seems thoroughly unwise, especially since gross appearance, habit, corollas, foliage, indument, etc., seem to vary quite independently of it. After many vain attempts to break up *Nolana* into what I would care to sponsor as natural genera, I am convinced that segregation of the genus is possible only if done in an arbitrary and artificial manner.

When I began this study, like many students in the past, I believed that the shrubby species of this group, called "*Dolia*" by the older authors (*Bargemontia*, however, is the prior name), could be recognized. Reluctantly, however, I have been forced to abandon this concept. The character most emphasized by the sponsors of "*Dolia*" has been the shrubby habit which is thought to set it off from the restricted *Nolana* and from the other segregates of *Nolana* such as *Sorema*. The primary habit-characters of "*Dolia*" have been supplemented by others and we find the genus characterized as shrubby plants with small narrow leaves, small flowers, and about 5 one- to few-seeded, ovoid or ellipsoid, well spaced, distinct, uniseriate nutlets. These characters, however, do not vary together. *Nolana galapagensis* is indistinguishable from many species of "*Dolia*" in habit and corolla, but is utterly different in the numerous pluriseriate nutlets. *Nolana aplocaryoides*, *N. gracillima*, and *N. laxa* have the flowers and fruit of "*Dolia*" but are small erect annual herbs. Large corollas are associated with the nutlets and habit of "*Dolia*" in such species as *N. flaccida*, *N. mollis*, *N. pilosa*, *N. leptophylla*, *N. lycioides*, etc. If we finally admit that corollas and fruit can not be used in defining "*Dolia*" and frankly admit that the genus is based only on the shrubby habit, we quickly get into more difficulties. In *Nolana*, in the broad sense, there are various species that exhibit transitions between the extremes of shrubby and herbaceous habit. Are such suffruticose species as *N. Gayana*, *N. intonsa* and *N. pallidula* to be placed in "*Dolia*"? They have numerous, pluriseriate nutlets but do have a habit which approaches that of such "*Dolias*" as *N. tarapacana*, *N. linearifolia* and even some forms of *N. crassulifolia*. Finally even within some species of "*Dolia*," such as *N. confinis*, *N. pilosa* and *N. linearifolia*, there is uncertainty of habit, some forms being shrubby and perennial and others distinctly herbaceous and annual. I am quite unable to see how "*Dolia*" can be defined unless such species as *N. galapagensis*, the annual "Dolias," and certain of the large-flowered species, despite their evident relationship among the various "True Dolias," are arbitrarily set off and treated as distinct genera. This is not only blatantly artificial but, in addition, would have a train

of consequences in the classification of the remaining species of *Nolana* and even in such aberrant "Dolias" as *N. thinophila, N. flaccida, N. mollis, N. tarapacana, N. linearifolia,* etc. I am therefore definitely opposed to the recognition of "*Dolia*," not only because I feel it would be artificial but also because of the number of small genera that would invariably have to accompany it.

Some attempt also has been made to segregate from *Nolana* another group of species to form the genus or section "*Sorema*" (*Periloba* is a prior name). This group, typified by *N. paradoxa,* differs from "*Eunolana*," typified by *N. humifusa,* in having the fruit composed of numerous one- to few-seeded, pluriseriate, rather than 5, large, multispermous, uniseriate nutlets. A study of all the species of "*Sorema*" and "*Eunolana*," particularly the Peruvian ones, shows a wealth of transitions between these two extremes of fruit. "*Sorema*" is usually defined as including herbaceous perennials with broad leaves and large flowers. In fact, however, the habit varies from annual on to perennial with a shrubby caudex, the leaves from narrowly spathulate on to very broad with a distinct blade and petiole, and the corolla from small on to very large and conspicuous. None of these characters varies with the fruit. "*Sorema*" can be given only the most arbitrary limits and as with "*Dolia*" the necessities of clarity in definition would inevitably force generic recognition on certain of the species with embarrassing combinations of characters, and logically upon some of the more striking species, such as *N. Adansoni, N. inflata,* etc. Any segregation of *Nolana* will cause this genus to disintegrate into a galaxy of very small genera. The facts are that the genus *Nolana,* as I have defined it, is composed of many selected, stable combinations of the numerous plays on the extreme variation observable in fruit, flower, habit and vegetative parts. The species are so distinct, their relationship so intricate, and their apparent affinity so dependent on the particular part of the plant stressed, that practicable natural groupings of them inside the genus, even into sections or species-groups, seem impossible to realize.

The taxonomic history of the Nolanaceae contains relatively few important names and has its sources in a relatively small library. The first important contribution to the subject, subsequent to the establishment of the genus *Nolana,* was by Ruiz and Pavon, Fl. Peruv. et Chile. **2:** 6–8, tab. 112–113, who in 1799 redescribed the type-species of the genus from wild plants and associated with it four newly proposed species from southern Peru. In 1836 Gaudichaud collected Nolanaceae at Valparaiso, Cobija and Callao and subse-

quently appears to have made a study of the family. His only published results, however, are the 16 beautiful folio plates, representing 9 new species and 4 new genera, which appeared in the botanical atlas of the reports on the voyage of the *Bonite*. The dates of this important work will be discussed in another paragraph. Modern classification of the Nolanaceae began with the studies by Lindley, Bot. Reg. **30**: sub tab. 46 (1844), who proposed 4 new genera and gave a synopsis of 19 species. Soon after Lindley's work Miers, Hooker London Jour. Bot. **4**: 365–71 and 498–509 (1845), gave a much more detailed account of the family, discussed its characters and relationships, and added a new genus and 10 newly proposed species. This work by Miers was subsequently reprinted with a few minor changes and the addition of three plates, in his Illustrations of South American Plants, **1**: 45–62, tab. 10–12 (1850). The treatment of Nolanaceae in DeCandolle's Prodromus, **13**[1]: 8–18 (1852), was written by Dunal. Dunal's treatment, largely based upon that of Miers, recognizes 23 species of *Nolana*, 5 of *Dolia*, 3 of *Alibrexia*, and 1 each of *Aplocarya* and *Bargemontia*. It is the last attempt to account for all the species. Many of the species he recognized are now known to be synonymous. Our modern conception of the size, number and diversity of the Nolanaceae began with the work of Philippi in 1860. In this year Philippi published his Florula Atacamensis, 43–45, in which 14 species were described or listed from the deserts of northern Chile. Later in various scattered papers he published additional novelties. His work on the family closed, however, in 1895 with that unfortunate paper, Plantas Nuevas Chilenas, Anal. Univ. Chile **91**: 27–47, in which, of a total of 35 newly proposed species, only 6 seem to be valid. Philippi named many of the species in that great center of the family in the provinces of Atacama and Antofagasta. The number of synonymous species he proposed, however, has been most confusing. The account of the family for the Die Natürlichen Pflanzenfamilien, iv. **3b**: 1–4 (1891), was written by Wettstein. He recognized 3 genera, *Nolana*, *Alona* and *Dolia*, mentioned 31 species and estimated the total number in the family at 50. Early in 1910 Reiche, Anal. Univ. Chile **125**: 482–507, gave his classification of the Chilean species, recognizing 24 species of *Nolana*, 3 of *Alona* and 13 of *Dolia*. This treatment was subsequently reprinted as part of his Flora de Chile, **5**: 410–435 (1910). It is the most extensive and imposing presentation of the family. It is, however, scarcely more than a half digested compilation, having the familiar blundering approach to his subject and the almost complete lack of any feeling for relationships that

characterize all of this author's work. In 1925 the present author collected in the coastal regions of northern Chile and subsequently studied in the Philippi Herbarium at Santiago. The result of this work was a report on the coastal flora of the provinces of Antofagasta and Tarapacá and northwestern Atacama published in 1929. Twenty-four Chilean species of Nolanaceae were discussed, Contr. Gray Herb. **85**: 103–112 and 156–159 (1929). In the same paper, l. c. 174–177, four new species were proposed from southern Peru.

Among those who have published on the Nolanaceae the work of Gaudichaud needs special comment. There is evidence that he intended to publish a revision of the family, but this was never realized. As a part of his study, however, he had prepared the series of 16 folio plates issued, over a decade, in the botanical atlas of the reports of the Voyage of the *Bonite* (tab. 8, 28, 33, 101–113). No descriptive text nor any designation of types was ever published by him for the 4 new genera and the 9 new species illustrated. The new species, being beautifully illustrated with a wealth of elaborate details, are legitimately published according to the rules of nomenclature. The new genera, as shown by Sprague, Kew Bull. 395 (1928), are also to be accepted. The date of publication to be assigned to these plates, however, has been a matter of dispute, those suggested varying as follows, 1839–51, 1839–46, 1844–66, 1846–49, etc. Fortunately the plates can be dated with some precision. Plates 8 and 28 are among those listed in Isis von Oken, p. 626, in 1842. Plate 8 is in livraison 1 which was listed by Baillieré, the London dealer who supplied this work to the library of the British Museum, in his invoice to the British Museum dated June 5, 1841. Plate 28, was in livraison 3, the publication of which was advertised in the Bibliographie de la France on Dec. 4, 1841. Plate 33 was in livraison 4 noted in the Baillieré invoice dated April 2, 1842. The early livraisons of the atlas contained 10 plates, but beginning with plate 101 they contained only 6. Plates 101–106 form livraison 19; 107–112 form livraison 20; and 113–118, livraison 21. The plates 101–118 in the library of the British Museum are all stamped "3JU52." This same accession date appears on Baillieré's invoice, dated Jan. 9, 1852, in which liv. 19, 20 and 21 are itemized. It is evident that Baillieré in London could not have received these three livraisons and had them ready to send to the British Museum within nine days of their first issue in Paris. It seems probable, therefore, that they must have been first issued in Paris near the close of 1851. In the present paper I have given the dates of plates 101–113 as "1851–52." The earlier date, however, is probably correct.

The Nolanaceae illustrated by Gaudichaud are based only in part upon the collections he made while botanist during the voyage of the *Bonite* in 1836 and 1837. During that voyage the *Bonite* visited only three ports within the range of the family, Valparaiso (June 11–24, 1836), Cobija (July 1–3, 1836), and Callao (July 11–21, 1836). Of the 16 plates of the Nolanaceae in the botanical atlas of the reports of the voyage of the *Bonite*, plates 33, 102, 103, 104, 106, 108, 111 and 112 represent species neither known nor to be expected at ports mentioned. Some of the illustrations were doubtless based upon the material collected by Gaudichaud during 1831 when he was attached to the frigate *l'Herminie* (under Capt. Villenueve de Bargemont) and visited Valparaiso, Coquimbo ("vu dans la plus mauvaise saison"), and Callao. Others are no doubt based upon collections by Bridges and possibly by Gay.

The location of Gaudichaud's type-specimens, that is to say the specimens from which his plates were drawn, remains uncertain. There are duplicates of some of the collections made during the *Bonite* voyage now preserved at Paris, Geneva, Berlin and Chicago. Few of these seem to have been actually determined by Gaudichaud himself. At Paris and Geneva I have seen some of the collections made by Gaudichaud during the voyage of *l'Herminie*. In none of the herbaria mentioned have I seen material of *Nolana polymorpha* Gaud. As Brongniart, Ann. Sci. Nat. Bot. ser. 6, **1**: 263 and 290, adnot. (1875), has suggested, I am inclined to believe that Gaudichaud's missing types may be found in the Webb collections at Florence. I found some of his memoranda and a few of his identifications among the Nolanaceae in the herbarium at Paris. We may suspect that most of his studies were based upon specimens in the Webb Herbarium which he could have consulted in Paris before it was finally sent to Italy.

In the early monographs of the Nolanaceae by Lindley and by Miers, many of the newly proposed species were based upon collections by Bridges and by Cuming. These collections, very important in the history of our family, were distributed with inadequate geographic data and in some cases, especially in Hooker's herbarium which was studied by Miers, were actually mislabeled or the numbers interchanged. Fortunately much of the confusion enveloping these collections can be dispelled. For convenience general facts regarding these collections are given here. Details and discussion of the particular cases of confusion will be found in the treatment of the species concerned.

Thomas Bridges collected from Copiapó to Coquimbo in 1841 and made the first representative collection of the flora of western Atacama. Coming from an unexplored region rich in Nolanaceae his collections contained a large proportion of then unknown species. These were subsequently named and described by Lindley and by Miers. Unfortunately Bridges' collections suffered badly through careless handling. Although he prepared a list (now preserved in the library of the botany department at South Kensington) in which data on habit, flower-color and collecting-locality are given for each of his numbered collections, his specimens were distributed either as from "Coquimbo," which is usually incorrect, or as from "Concepcion," which is grotesquely so. What is more, as noted by Miers, Ill. So. Am. Pl. **2**: 25, adnot. (1857), his specimens have frequently had their numbers interchanged or badly misread. Those in Lindley's herbarium seem to be prevailingly correct. However, those in Hooker's herbarium, which were studied by Miers, are badly confused. For clarity, therefore, I am giving here all the data on the Nolanaceae contained in Bridges's numerical list.

No. 1322. Annual, 6 inches high, flowers white, abundant on the sandy hills and plains between Copiapó and Huasco.—In the Hooker collections this specimen is falsely associated with no. 1323. The collection is the type of both *Alona baccata* Lindl. and *Sorema linearis* Miers.

No. 1323. Shrub, 2–3 ft. high, flowers pale blue, near coast between Huasco and Coquimbo.—In the Hooker collections falsely numbered 1325. It is the type of *Alona ericifolia* Miers.

No. 1324. Shrub 1–3 ft. high, flowers pale blue, near coast, Coquimbo. —Correctly numbered in the Hooker collections. This is the type-collection of *Dolia clavata* Miers.

No. 1325. "Cuchipepo," annual, 1 ft. high, flowers blue, near coast, Coquimbo.—In the Hooker collections bearing the no. 1322. This is the type of *Sorema acuminata* Miers.

No. 1326. Shrub 1–2 ft. tall, flowers blue, near Vallenar in dry stony places.—In the Hooker collections bearing the number 1327. This specimen is the type of *Alona rostrata* Lindl.

No. 1327. Shrub 1–2 ft. high, flowers white, with last, a white flowered form.—In the Hooker collections numbered 1326. The type-collection of *Alona obtusa* Lindl.

No. 1328. Shrub 1–3 ft. tall, flowers pale blue, near port of Peña Blanca, between Huasco and Coquimbo.—Correctly numbered in the Hooker herbarium. The type-collection of *Alona carnosa* Lindl.

No. 1329. Shrub 1–3 ft. tall, flowers dark blue, hills near the town of Frierina, Valley of Huasco, a splendid flower.—Correctly numbered in the Hooker collections. This specimen represents *Alona coelestis* Lindl.

No. 1330. Shrub 1–3 ft. tall, flowers white, coast between Huasco and Coquimbo.—This collection appears in the Hooker collections under no. 1331 and though correctly numbered in the Lindley herbarium was misread and cited by Lindley as no. 1336. It represents *Nolana sedifolia*.

Hugh Cuming collected some Nolanaceae about Valparaiso but his collections of most concern to us are contained in three blocks of numbers given in a list at South Kensington as follows,—nos. 853–911, "Coquimbo," August 1828; Nos. 912–959, "Cobija, Iqueque and Arica," Sept. and Oct. 1828; and nos. 960–1090, "Peru," Nov. and Dec. 1828. Specimens of the second block, nos. 912–959, appear in the Hooker herbarium incorrectly labeled as from Peru and even as from Lima. The one specimen of the Nolanaceae of this block, the type of *Dolia leptophylla* Miers, probably came from Cobija. From my study of the collections made by Cuming, in the Nolanaceae as well as in other families, it is increasingly apparent that his block of numbers, 853–911, usually appearing on labels as from "Coquimbo," really covers material, part of which must have been obtained along the coast north of that port. Since Cuming traveled by a small boat and in 1828 was still primarily a collector of shells, we may believe that the questioned plants were obtained near some of his anchorages as he slowly worked northward and that they were grouped with those he obtained at his last important port of call, Coquimbo. I am willing to believe that some of the block, nos. 853–911, may have been obtained as far north as Huasco or even Caldera or Taltal. In any case, as regards Cuming's locality "Coquimbo," one must be prepared to interpret it broadly.

For the preparation of this study of the Nolanaceae I have worked in the herbaria of the Royal Botanic Gardens at Kew (K), the British Museum at South Kensington (BM), the Lindley Herbarium at Cambridge University (Lind.), the Botanical Institute at Hamburg (Hamburg), the Botanical Museum at Berlin-Dahlem (BD), the Delessert and the Barbey-Boissier herbaria at Geneva (Deles.; DC; Boiss.), and the Museum of Natural History at Paris (Paris). Through the kindness of the several curators, certain specimens of particular interest, which I had extracted from the herbaria at Kew, South Kensington, Hamburg, Berlin, and Paris, were later sent to the Arnold Arboretum for more detailed final study. During the final work on the paper I also had available at the Arnold Arboretum loans of the entire representation of the family from the Gray Herbarium (G), the New York Botanic Garden (NY), the United States National Herbarium (US) and the Field Museum (FM). With two exceptions I have seen during the course of the work on this paper all the important collections of the Nolanaceae. The Webb Herbarium at Florence was not seen, but of the Gaudichaud collections, which make Florence important, I have seen various duplicates at Berlin, Geneva and Paris.

The Philippi Herbarium at Santiago (MS) was not studied for this paper, but was visited during my year in Chile in 1925–26 when I collected many Nolanaceae in northern Chile and named and compared them with Philippi's types at Santiago. The notes and the identifications which I made in the Philippi Herbarium, and the numerous specimens which were named and distributed by Philippi and are now preserved at Kew, South Kensington, Berlin, and Washington, have served as an adequate basis for the judgment of Philippi's work on the family. In my work at the various museums and in my requests for loans I have uniformly met with kindness and sympathetic interest. This paper could not have been written without the friendly cooperation of the curators and workers in the institutions mentioned. For their help and many courtesies I am most grateful.

Nolanaceae Dumort.

Nolanaceae Dumortier, Analy. Fam. Pl. 24 (1829); Lindley, Nixus Pl. 18 (1833); Martius, Consp. Reg. Veg. 21 (1835); Lindley, Nat. Syst. ed. 2, 229 (1836), excl. *Falkia* and *Dichondra;* Endlicher, Gen. Pl. 655 (1838); Meisner, Pl. Vasc. Gen. **1:** 275 and **2:** 182 (1840); Endlicher, Ench. Bot. 326 (1841); Lindley, Bot. Reg. **30:** sub tab. 46 (1844); Miers, Hooker London Jour. Bot. **4:** 366 and 514 (1845), excl. *Grabowskya;* Lindley, Veg. Kingd. 654 (1847); Agardh, Theor. Syst. Pl. 360 (1858); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b:** 1 (1891); Dalla Torre and Harms, Gen. Siphonogam. 448 (1904).

Nolanales Lindley, Nixus Pl. 18 (1833).

Nolaneae, (sect. Solanac.) Reichenbach, Consp. Reg. Veg. 125 (1828), excl. *Triguera;* (tribo Solanac.) Lindley, Nat. Syst. 233 (1830); (familia) Brongniart, Enum. Gen. Pl. 55 (1843); (tribo Nolanac.) Miers, Hooker London Jour. Bot. **4:** 514 (1845); (tribo Solanac.) Dunal in DeCandolle, Prodr. **13**[1]: 8 (1852), excl. *Grabowskya;* (familia) LeMaout and Decaisne, Traité Gén. Bot. 181 (1868); (tribo Solanac.) Eichler, Blüthendiagr. **1:** 206 (1875); (tribo Convolvulac.) Bentham and Hooker, Gen. Pl. **2:** 867 and 879 (1876); (sect. Solanac.) Baillon, Hist. Pl. **9:** 312 and 352 (1888); (? sect. Solanac.) Solereder, Syst. Anat. Dicotyled. 648 (1899).

Nolanieae (tribo Solanac.) G. Don, Gen. Syst. **4:** 479 (1837).

Nolanineae (subtribo Solanac.) Dunal in DeCandolle, Prodr. **13**[1]: 9 (1852).

Nolanidia (familia), Rafinesque, Analys. Nat. 186 (1815), excl. *Siphonanthus,* and Fl. Tellur. **4:** 87 (1838).

Nolanidae (familia) Burnett, Outlines Bot. **2:** 1106 (1835).

KEY TO THE GENERA.

Fruit schizocarpic, rounded or merely 5-sulcate, composed of 5 multispermous sections which are broadly affixed to the receptacle and are broadly joined to one another laterally; plants shrubby ..... 1. *Alona.*

Fruit deeply lobed, composed of 3 to many, few- to many-seeded, distinct nutlets which are attached only to the receptacle and are free or practically so from one another; plants herbs or shrubs . . 2. *Nolana.*

1. **Alona** Lindl.

Alona Lindley, Bot. Reg. **30**: tab. 46 (1844); Walpers, Repert. **6**: 548 (1847); Bentham and Hooker, Gen. Pl. **2**: 879 (1876); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891) Reiche, Anal. Univ. Chile **125**: 494 (1910) and Fl. Chile **5**: 422 (1910).—Type-species: *Alona coelestis* Lindl.

Nolana sect. *Alona* (Lindl.) Miers, Hooker London Jour. Bot. **4**: 500 (1845) and Ill. So. Am. Pl. **1**: 53 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 13 (1852).

Rayera Gaudichaud, Bot. Voyage Bonite, Atlas tab. 108 (1851–52). —Type-species: *R. teretifolia* Gaud. (*Alona rostrata* Lindl.).

Ostcocarpus Philippi, Gartenflora **33**: 39 and 356, tab. 1175 (1884); Philippi, Anal. Univ. Chile **91**: 40 (1895).—Type-species: *Alona rostrata* Lindl.

KEY TO THE SPECIES.

Calyx with lobes only 1–3 mm. long, split and becoming deeply 1–2-cleft by the expanding corolla.

Shrub slender-stemmed and loosely branched; leaves more or less scattered, terete and slender, ascending; corolla 2–2.5 cm. long; pedicels usually short, becoming 5–8 mm. long ..... 1. *A. rostrata.*

Shrub low and dense; leaves crowded, short, triquetrous, divergent; corolla 2.5–3 cm. long; pedicels becoming 10–25 mm. long. 2. *A. carnosa.*

Calyx with well developed lobes, 3–9 mm. long, not split by the expanding corolla.

Stems, leaves and calyx finely glandular and usually distinctly resinous; not at all hairy.

Calyx-lobes linear, separated by very broad rounded open sinus. 3. *A. filifolia.*

Calyx-lobes subulate, separated by narrow acute sinus. 4. *A. balsamiflua.*

Stems, leaves and calyx covered with fine soft spreading more or less glandular hairs.

Leaves 0.3–0.9 mm. broad, very slender; shrubs 3–10 dm. tall; calyx cut only down to middle ..... 5. *A. coelestis.*

Leaves 1–2.5 mm. broad; shrub spreading, 1.5–3 dm. tall; calyx cut to beyond the middle ..... 6. *A. stenophylla.*

1. **Alona rostrata** Lindl.

Alona rostrata Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Gay, Fl. Chile **5**: 110 (1849); Reiche, Anal. Univ. Chile **125**: 495 (1910) and Fl. Chile **5**: 423 (1910).—Type given as from Coquimbo, but in fact from Vallenar, *Bridges 1326.*

Nolana rostrata (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Ostreocarpus rostratus (Lindl.) Philippi, Gartenflora **33**: 356 and 38, tab. 1175 (1884) and Anal. Univ. Chile **91**: 40 (1895).

Alona obtusa Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Gay, Fl. Chile **5**: 110 (1849); Reiche, Anal. Univ. Chile **125**: 497 (1910) and Fl. Chile **5**: 425 (1910).—Type given as from Coquimbo, but in fact from Vallenar, *Bridges 1327*.

Nolana obtusa (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Rayera teretifolia Gaudichaud, Bot. Voyage Bonite, Atlas tab. 108 (1851–52).—Type never indicated.

Alona Miersii Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891), nomen; Philippi, Anal. Univ. Chile **91**: 35 (1895), description; Reiche, Anal. Univ. Chile **125**: 496 (1910) and Fl. Chile **5**: 424 (1910).—Type collected at Chañarcillo in 1885.

Alona phylicifolia Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3, fig. 1 (1891), nomen; Philippi, Anal. Univ. Chile **91**: 36 (1895), description; Reiche, Anal. Univ. Chile **125**: 496 (1910) and Fl. Chile **5**: 424 (1910).—Type collected at Caldera by Paul Ortega in 1879.

Alona Fonckii Philippi, Anal. Univ. Chile **91**: 36 (1895); Reiche, Anal. Univ. Chile **125**: 496 (1910) and Fl. Chile **5**: 424 (1910).—Type collected at La Higuera, prov. Coquimbo in Jan. 1886 by Francisco Fonck.

Ostreocarpus brevifolius Philippi, Anal. Univ. Chile **91**: 40 (1895).—Based upon collections from Chañarcillo and Pabellon, prov. Atacama.

Ostreocarpus lepidophyllus Philippi, Anal. Univ. Chile **91**: 42 (1895).—Type collected Sept. 1885 near Caldera by F. Philippi.

Alona lepidophylla (Phil.) Reiche, Anal. Univ. Chile **125**: 497 (1910) and Fl. Chile **5**: 425 (1910).

Nolana lepidophylla (Phil.) Johnston, Contr. Gray Herb. **85**: 103 (1929).

CHILE: Arid hillsides back from the coast, from the northern parts of the province of Coquimbo northward into Atacama to beyond the Copiapó Valley, lat. 29° 30′ to 27° S.

SELECTED SPECIMENS: La Higuera, *Fonck* (BM, ISOTYPE of *A. Fonckii*); near Vallenar, in dry stony places, shrub 3–6 dm. tall, corolla light blue, *Bridges 1326* (Lindl., TYPE of *A. rostrata*); near Vallenar, in dry stony places, shrub 3–6 dm. tall, corolla white, *Bridges 1327* (Lindl.; K, TYPE of *A. obtusa*); Alto de Carmen, in valley above Vallenar, small shrub 4 dm. tall, corolla blue, *Werdermann 150* (G, BD) Chañarcillo, *Philippi* as *A. Miersii* (US, K, BD); Chañarcillo, Sept. 24, 1885, *Borchers* as *A. rostrata* (BM); dry slopes near Tierra Amarilla, *Werdermann 412* (G, BD); Quebrada de Chanchoquin, north of Copiapó, 1885, *Gigoux* (G).

This is a very slender, loosely branched, sprawling shrub. It has accumulated a surprising number of synonyms. It should be noted that in his catalogue Bridges listed his nos. 1326 and 1327, the types of *A. rostrata* and *A. obtusa*, as collected in the same locality and as representing the normal blue-flowered form and an albino form of the same species. The species is a very distinct one and has evident relations only in *A. carnosa*.

2. **Alona carnosa** Lindl.

Alona carnosa Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Gay, Fl. Chile **5**: 111 (1849); Reiche, Anal. Univ. Chile **125**: 496 (1910) and Fl. Chile **5**: 424 (1910).—Based upon material cited, "Coquimbo (herb. Bridges, 1328; Cuming, 863)." This was probably collected, however, well to the north of the port of Coquimbo.

Nolana carnosa (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Alona vernicosa Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 10 and 218 (1860).—Type collected at Caldera by Philippi.

Alona sedifolia Philippi, Cat. Pl. Itin. Tarapaca 69 (1891).—Type given as from Chiapa, lat. 19° 32′ S., long. 69° 12′ W., but probably in fact from Caldera.

Alona grandiflora Philippi, Anal. Univ. Chile **91**: 37 (1895).—Type from northern Chile.

CHILE: Sandy plains of the prov. Atacama, from Caldera to Peña Blanca, chiefly along the ocean. Reports from Coquimbo are questionable.

SELECTED SPECIMENS: Caldera, *ex Philippi* as *A. vernicosa* (BM); Caldera, bush 3–10 dm. tall, dominant on sandy plain, 1925, *Johnston 5047* (G); dunes north of Caldera, suffruticose, 15 cm. tall, 1924, *Werdermann 383* (G, BD); Caldera, Oct. 20, 1890, *Morong 1274* (FM); Caldera, 3–6 dm. tall, sandy places, 1864, *Pearce* (K, BM); Chañarcito, Sept. 24, 1885, *Borchers* (BM); near port of Peña Blanca between Huasco and Coquimbo, shrub 3–6 dm. tall, *Bridges 1328* (Lindl., K); "Coquimbo," *Cuming 863* (K, BM).

A very distinct species having evident relations with *A. rostrata*. Its relative is very slender, laxly branched and sprawling. *Alona carnosa* is a compact densely and ascendingly branched bush with abundant triquetrous leaves and larger fruit and flowers. It is a plant of the sandy coastal plains and not, as is its relative, a frequenter of rocky hillsides of the interior.

While at Santiago in 1926 I compared the type of *A. sedifolia* with material collected at Caldera and found them specifically identical. Since *A. carnosa* is indubitably known only from the coastal region of

western Atacama there is good reason for questioning the accuracy of the label accompanying the type of *A. sedifolia*. The type of *A. sedifolia* is said to have come from Chiapa in the high deserts of the province of Tarapacá, almost 190 km. east of the port of Pisagua. It is, however, more credible to think that the type of *A. sedifolia* was collected at Caldera, the starting point of the expedition that collected it, and that subsequently the specimen was somehow mislabeled.

3. **Alona filifolia** (H. & A.), comb. nov.

Convolvulus ? filifolius Hooker and Arnott, Bot. Beechey Voyage **1**: 35 (1830); Hallier, Bull. Herb. Boiss. **6**: 720 (1898).—Type collected at Coquimbo.

Nolana filifolia (H. and A.) Johnston, Revista Chilena **34**: 231 (1930).

Convolvulus linifolius Hooker and Arnott ex Choisy in DeCandolle, Prodr. **9**: 389 (1845); Hallier, Bull. Herb. Boiss. **6**: 721 (1898).—lapsu calami.

Nolana Chastenayana Gaudichaud, Bot. Voyage Bonite, Atlas tab. 33 (1842); Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).—Types never indicated.

Alona Chastenayana (Gaud.) Gaudichaud ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3**b: 3 (1891).

Alona glandulosa Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Gay, Fl. Chile **5**: 111 (1849); Reiche, Anal. Univ. Chile **125**: 497 (1910) and Fl. Chile 5: 425 (1910).—Type collected at Coquimbo by Macrae in 1825.

Nolana glandulosa (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Ipomoea Cruckshanksii Choisy in DeCandolle, Prodr. **9**: 389 (1845); Hallier, Bot. Jahrb. **16**: 559 (1893) and Bull. Herb. Boiss. **6**: 723 (1898).—Type collected at Coquimbo by Cruckshanks.

Fabiana grandiflora Dunal in DeCandolle, Prodr. **13**[1]: 591 (1852); Reiche, Anal. Univ. Chile **124**: 761 (1909) and Fl. Chile **5**: 377 (1910).—Type collected by Gay in the province of Coquimbo, probably on hills about La Serena.

? Osteocarpus foliolosus Philippi, Anal. Univ. Chile **91**: 42 (1895).—Type collected by F. Philippi in Queb. de Injenio near Ovalle.

CHILE: Dry gravelly benches and hillsides in the province of Coquimbo, lat. 29° 30′ to 31° S. mostly back from the coast.

SELECTED SPECIMENS: Coquimbo, 1831, *Gaudichaud 65* (Paris), *Harvey* (G), *Macrae* (Lindl. Deles. K); shrub 5 dm. tall, common on hills about La Serena, *Gay 2* (Paris); Coquimbo, shrub 6–9 dm. tall in dry rocky places, *Elliott 5* (K); Vicuña, 900–1200 m. alt., *Elliott 94* (K); Fray Jorge, low slender shrub 2 dm. tall, *Werdermann 928* (G, BD).

The first *Alona* known to science. It was collected near Coquimbo by Macrae in Nov. 1825 and described subsequently as a species of *Convolvulus*. Extending into the southern parts of the province of Coquimbo it sets the southern limit for the dispersal of the genus. The species is a well marked one.

4. **Alona balsamiflua** Gaud.

Alona balsamiflua Gaudichaud, Bot. Voyage Bonite, Atlas tab. 107 (1851–52).—Type collected at Cobija by Gaudichaud.

CHILE: Known only from Cobija, prov. Antofagasta, lat. 22° 30′ S.

I know of only two collections of this interesting plant, both from Cobija, one by d'Orbigny (no. 275) in April 1830, and the other by Gaudichaud in July 1836. Gaudichaud published an excellent, elaborately detailed illustration of his plant. No description of this very distinct species has ever been published. *Alona balsamiflua* is the most northerly ranging species of its genus.

5. **Alona coelestis** Lindl.

Alona coelestis Lindley, Bot. Reg. **30**: tab. 46 (1844); Paxton, Mag. Bot. **12**: 3, cum tab. (1845); Gay, Fl. Chile **5**: 110 (1849); Gaudichaud, Bot. Voyage Bonite, Atlas tab. 106 (1851–52); (*A. caelestis*) F. Philippi, Cat. Pl. Vasc. Chile 230 (1881); Reiche, Anal. Univ. Chile **125**: 498 (1910) and Fl. Chile **5**: 426 (1910).—Based upon garden material raised from seeds collected by Bridges in Chile and upon herbarium material cited as from, "Coquimbo, (herb. Cuming, 857; Bridges, 1329)."

Nolana coelestis (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 13 (1852); (*N. caelestis*) F. Philippi, Cat. Pl. Vasc. Chile 230 and 232 (1881).

Alona ericifolia Miers, Hooker London Jour. Bot. **4**: 500 (1845) and Ill. So. Am. Pl. **1**: 54 (1850); Gay, Fl. Chile **5**: 112 (1849); Reiche, Anal. Univ. Chile **125**: 497 (1910) and Fl. Chile **5**: 425 (1910).—Type labelled as being "*Bridges 1325*" and as from "Concepcion." The collection, however, is really *Bridges 1323* and actually from between Huasco and Coquimbo.

Nolana ericifolia (Miers) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Alona floribunda Philippi, Anal. Univ. Chile **43**: 525 (1873).—Type from Huasco.

CHILE: Mostly near the coast; best known from the southwestern parts of the province of Atacama in the lower Huasco Valley. Otherwise known only from near Coquimbo.

SELECTED SPECIMENS: Huasco, *Reed* as *A. floribunda* (K, BM); Huasco, *ex Philippi* as *A. floribunda* (BM, BD, Deles.); Huasco, *Jaffuel 1173* and *1190* (G); hills near Freirina, shrub 3–9 dm. tall, *Bridges 1329* (Lindl., TYPE); near coast between Huasco and Coquimbo, shrub 6–9 dm. tall, flowers pale blue, *Bridges 1323* (Lindl.; sub no. 1325, K, TYPE of *A. ericifolia*); Coquimbo, *Cuming 857* (K), *Gaudichaud 66*, *67* and *72* (Paris).

Although Lindley, in describing *A. coelestis*, cites *Bridges 1329* as from Coquimbo it is to be noted that Bridges in his plant-list gives this number as collected in the hills near the town of Freirina in the valley of Huasco. He notes that it is "a splendid flower." The garden material illustrated by Lindley is said to have been raised from seeds sent by Bridges. These also may have come from Freirina.

6. **Alona stenophylla** (Johnston), comb. nov.

Nolana stenophylla Johnston, Contr. Gray Herb. **85**: 103 (1929).—Type from near Aguada del Cardon, *Johnston 5272*.

CHILE: Gravelly bench near the sea, prov. Antofagasta, lat. 24° 45′ S.

Known only from the type-collection. A lax decumbent shrub 1.5–3 dm. tall. The species is a very distinct one with its closest relative, perhaps, in *A. coelestis*.

2. **Nolana** Linn.

Nolana Linnaeus, Sp. Pl. ed. 2, **1**: 202 (1762), nomen; Linnaeus fil. Dec. Pl. Rar. Hort. Upsala **1**: 3, tab. 2 (1762); Linnaeus, Gen. Pl. ed. 6, 79 (1764); Linnaeus, Syst. ed. 12, 149 (1767); Endlicher, Gen. Pl. 655 (1839); Dunal in DeCandolle, Prodr. **13**[1]: 9 (1852); Bentham and Hooker, Gen. Pl. **2**: 879 (1876); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 2 (1891); Reiche, Anal. Univ. Chile **125**: 483 (1910) and Fl. Chile **5**: 411 (1910).—Type-species: *N. prostrata* Linn. (*N. humifusa* Johnston).

Nonala Linnaeus ex Durand, Ind. Gen. Phan. 287 (1888), lapsu calami.

Tula Adanson, Fam. Pl. **2**: 500 (1763), mononomial; Poiret, Encyc. Meth. **8**: 131 (1808), mononomial; Roemer and Schultes, Syst. **4**: pg. xxv. (1819); Jussieu, Mem. Mus. Paris **6**: 385 (1820); DeCandolle, Prodr. **4**: 418 (1830); G. Don. Gen. Syst. **3**: 524 (1834); Endlicher, Gen. Pl. 550 (1838); Meisner, Pl. Vasc. Gen. **1**: 159 (1838) and **2**: 114 (1838); Dunal in DeCandolle, Prodr. **13**[1]: 13 adnot. (1852); Bentham and Hooker, Gen. Pl. **2**: 29 (1873); Dalla Torre and Harms, Gen. Siphonogam. 509 (1905).—Type-species: *T. Adansoni* R. and S.

Tuba Adanson ex Spach, Hist. Veg. **8**: 373 (1839), lapsu calami.

Neudorfia Adanson, Fam. Pl. **2**: 219 and 582 (1763), mononomial.

Neudorffia Adanson ex Steudel, Nomencl. 553 (1821), lapsu calami.

Zwingera Hofer, Acta Helv. **5**: 267, tab. 1 (1763–64); Necker, Elem. **3**: 385 (1790).—Type-species: *Atropa humifusa* Gouan.

Swingera Hofer ex Dunal in DeCandolle, Prodr. **13**[1]: 9 (1852), lapsus.

Walkeria Miller ex Ehret, Phil. Trans. London **53**: 131, tab. 10 (1764), mononomial.

Teganium Schmidel, Icon. Pl. 67, tab. 18 (1766?), mononomial.

Periloba Rafinesque, Fl. Tell. **4**: 87 (1838); Johnston, Contr. Gray Herb. **85**: 104 (1829).—Type-species: *N. paradoxa* Lindl.

Nolana subgen. *Iohypa* Rafinesque, Fl. Tell. **4**: 87 (1838).—Type-species: *N. prostrata* L.

Nolana subgen. *Periesta* Rafinesque, Fl. Tell. **4**: 87 (1838).—Type species: *N. coronata* R. and P.

Nolana subgen. *Spatulina* Rafinesque, Fl. Tell. **4**: 87 (1838).—Type-species: *N. spathulata* R. and P.

Nolana subgen. *Gastrina* Rafinesque, Fl. Tell. **4**: 87 (1838).—Type-species: *N. inflata* R. and P. and *N. revoluta* R. and P.

Bargemontia Gaudichaud, Bot. Voyage Bonite, Atlas tab. 8 (1841); Walpers, Repert. **6**: 551 (1847); Dunal in DeCandolle, Prodr. **13**[1]: 18 (1852); Bentham and Hooker, Gen. Pl. **2**: 880 (1876); Johnston, Contr. Gray Herb. **85**: 105 (1929).—Type-species: *B. peruviana* Gaud.

Sorema Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Walpers, Repert. **6**: 547 (1847); Miers, Hooker London Jour. Bot. **4**: 368 (1845) and Ill. So. Am. Pl. **1**: 48 (1850).—Type-species: *N. paradoxa* Lindl.

Nolana sect. *Sorema* (Lindl.) Miers, Hooker London Jour. Bot. **4**: 500 (1845) and Ill. So. Am. Pl. **1**: 53 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 11 (1852); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891); Reiche, Anal. Univ. Chile **125**: 483 (1910) and Fl. Chile **5**: 411 (1910).

Dolia Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Walpers, Repert. **6**: 551 (1847); Bentham and Hooker, Gen. Pl. **2**: 880 (1876); Dunal in DeCandolle, Prodr. **13**[1]: 15 (1852); Miers, Hooker London Jour. Bot. **4**: 502 (1845) and Ill. So. Am. Pl. **1**: 55, tab. 12 (1850); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891); Reiche, Anal. Univ. Chile **125**: 501 (1910) and Fl. Chile **5**: 429 (1910).—Type-species: *D. vermiculata* Lindl. (*N. sedifolia* Poepp.).

Aplocarya Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Walpers, Repert. **6**: 55 (1847); Dunal in DeCandolle, Prodr. **13**[1]: 18 (1857).—Type-species: *A. divaricata* Lindl.

Alibrexia Miers, Hooker London Jour. Bot. **4**: 506 (1845) and Ill. So. Am. Pl. **1**: 59, tab. 11 (1850); Walpers, Repert. **6**: 550 (1847); Dunal in DeCandolle, Prodr. **13**[1]: 16 (1852).—Type-species: *A. rupicola* Miers (*N. crassulifolia* Poepp.).

Nolana sect. *Eunolana* Miers, Hooker London Jour. Bot. **4**: 500 (1845) and Ill. So. Am. Pl. **1**: 53 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 9 (1852); Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv.

3b: 2 (1891); Reiche, Anal. Univ. Chile **125:** 483 (1910) and Fl. Chile **5:** 411 (1910).

Gubleria Gaudichaud, Bot. Voyage Bonite, Atlas tab. 104 (1851–52). —Type-species: *G. baccata* [Lindl.] Gaud.

Velpeaulia Gaudichaud, Bot. Voyage Bonite, Atlas tab. 109 (1851–52).—Type-species: *V. alibrexioides* Gaud. (*N. leptophylla* Johnston).

Leloutrea Gaudichaud, Bot. Voyage Bonite, Atlas tab. 110 (1851–52).—Type-species: *L. aplocaryoides* Gaud.

Pachysolen Philippi, Anal. Univ. Chile **91:** 45 (1895), gen. provis.; Reiche, Anal. Univ. Chile **125:** 503 (1910) and Fl. Chile **5:** 431 (1910). —Type-species: *Dolia eremobia* Phil. (*N. incana* Johnston).

Nolana sec. *Pteronolana* Kuntze ex Post and Kuntze, Lexicon 390 (1904).—Type-species: *N. pterocarpa* Phil.

KEY TO THE SPECIES.

Nutlets 10 to numerous, in 2 or more ranks differing in position on the receptacle or in size or both. (cf. nos. 31, 32 and 33).
- Calyx at anthesis irregular, deeply cleft on one side, the lobes elongate, with closed sinus, usually more or less broadened above the middle and hence more or less spathulate.
  - Leaf-blades broadly lanceolate to cordate, abruptly contracted into a slender well developed petiole of about equal length.
    - Blades with base cordate or reniform, 20–40 mm. broad; corolla 3–4 cm. long ..... 1. *N. spathulata.*
    - Blades with base angulate or rounded, 4–18 mm. broad; corolla 2–3 cm. long ..... 2. *N. arenicola.*
  - Leaf-blades spathulate to oblanceolate, gradually contracted towards stem, lacking a distinct well-developed petiole.
    - Blades much compressed, flat, 7–18 mm. broad; calyx-lobes herbaceous, more or less spreading ..... 3. *N. latipes.*
    - Blades very succulent, thick, 2–6 mm. broad; calyx-lobes succulent, erect ..... 4. *N. pallidula.*
- Calyx at anthesis symmetrical or nearly so, not cleft on one side, with 5 teeth or lobes which are broadest at the base.
  - Middle cauline leaves gradually expanded from their attachment, without a well defined petiole, linear to spathulate or oblanceolate.
    - Plant an erect shrub becoming nearly a meter tall; corolla white, subtubular, 2–3 times as long as broad; Galapagos Islands ..... 5. *N. galapagensis.*
    - Plant an annual herb or more or less herbaceous perennial, with decumbent or prostrate stem; corolla usually blue, funnelform, not much longer than broad; continental.
      - Leaves and stem with a felt-like indument of abundant short forked or stellate hairs; central Peru ..... 6. *N. Gayana.*
      - Leaves and stems with simple hairs or entirely glabrous; Chilean except sometimes no. 12.
        - Plant conspicuously shaggy-villous; calyx not angulate 7. *N. intonsa.*
        - Plant glabrous or with short inconspicuous hairs; calyx angulate.
          - Pedicels 0–3 mm. long, erect; calyx-lobes with broad obtuse tips, unequal, sinus closed ..... 8. *N. sessiliflora.*

Pedicels becoming 1 cm. long or more in maturity, spreading or recurved; calyx-lobes with acute to acuminate tips, equal or practically so, sinus open.
Corolla scarcely if at all surpassing the calyx, white, 4–6 mm. long; a decumbent non-glandular plant with keeled angulate nutlets.....9. *N. parviflora.*
Corolla very conspicuously surpassing calyx, over 15 mm. long, blue except in forms of no. 11.
Nutlets compressed laterally and encircled by a broad evident vertical wing; leaf-margins strongly inrolled.....10. *N. pterocarpa.*
Nutlets rounded or angulate, usually irregularly polyhedral, wingless or narrowly and horizontally winged around the apical end.
Plant an erect annual herb, ascendingly branched chiefly above the middle; nutlets frequently with an apical wing; corolla blue or white 11. *N. baccata.*
Plant spreading, prostrate or decumbent, the leafy stems springing from a well developed and usually persisting basal rosette of leaves; corolla blue; nutlets apterous.
Bases of bracts and upper cauline leaves conspicuously long decurrent.
Plant glabrous; corolla 15–20 mm. long. 12. *N. Jaffuelii.*
Plant hairy; corolla 30–50 mm. long. 13. *N. elegans.*
Bases of bracts and upper cauline leaves auriculate or abruptly short decurrent.
Plant abundantly stipitate-glandular at least in the inflorescence; leaves elongate, firm, more or less strap-shaped, usually with a subauriculate somewhat clasping sessile base; plant usually perennial from a caudex.....14. *N. rupicola.*
Plant sparsely glandular and hence greener, leaves usually broader and less firm, the bases usually abruptly decurrent; plant annual, never with a shrubby caudex.....15. *N. acuminata.*
Middle cauline leaves with a definite petiole that is abruptly expanded above into a broad flat blade.
Nutlets large, 3–6 mm. long, in at least 2 very distinct ranks, pericarp becoming corky; sea-shore perennial with a deep fleshy tap-root, central Chile.....16. *N. paradoxa.*
Nutlets small, 1–3 mm. long, in several crowded and confused ranks, pericarp not corky; plants of coastal deserts of Peru, root not conspicuously fleshy if at all so.
Petiole abruptly expanded into an evident semiamplexicaul stipular base; plant annual, erect, glabrous or nearly so; leaf-blades reniform or cordate.....17. *N. Adansoni.*
Petiole not abruptly expanded and semiamplexicaul at the very base; plant persistent, more or less pubescent; leaf-blades ovate to oblong, base obtuse or rounded.
Leaf-blades glandular villous, thickish, 1–1.5 cm. long; calyx firm, not conspicuously inflated; pedicels 1 cm. long or less; plant from a distinctly woody spreading caudex.....18. *N. insularis.*

Leaf-blades stipitate-glandular, thin, veiny, large, becoming 5–10 cm. long; calyx bladder-inflated; pedicels very slender, 1–5 cm. long; plant slender, decumbent or ascending.....19. *N. inflata.*

Nutlets less than 10, prevailingly 5, more or less distinctly uniseriate.

Nutlets large, broadly affixed in deep sockets in the receptacle, crowded with their broad flat proximate sides closely appressed to one another.

Plant glabrous or practically so.

Corolla 1.5–2 cm. long; mature calyx with a prominent triangular pleat at the bases of each sinus, hence abruptly contracted beneath the sinus.....20. *N. humifusa.*

Corolla 2–3 cm. long; mature calyx not prominently pleated at the sinus, evenly rounded off beneath it.....21. *N. coronata.*

Plant villous and glandular.

Calyx conspicuously plicate, strongly folded between the broad triangular lobes; herbage grayish with abundant short stiffish erect hairs; leaf-margin revolute.....22. *N. plicata.*

Calyx not folded between the lanceolate or oblong obtusish lobes; herbage glabrescent, the few hairs long and weak; leaf-margins not revolute.....23. *N. Guentheri.*

Nutlets smaller, narrowly affixed at or just above the base, more or less globose or ovoid, their proximate sides usually convex (cf. no. 8).

Calyx with 1–2 deep clefts, the proper calyx-lobes reduced, either absent or inconspicuous.

Corolla 2.5–4 cm. broad; plant perennial, shrubby; calyx pubescent, the clefts equal, the resulting segments spreading with their tips 2–4-dentate.....24. *N. polymorpha.*

Corolla ca. 1 cm. broad; plant annual; calyx glabrous and glandular-glutinous, the clefts unequal, the resulting segments with acute edentate tips.....25. *N. thinophila.*

Calyx with 5 regular well developed teeth or lobes, not cleft on the sides.

Plants annual, herbs, stems erect or strongly ascending.

Mature calyces subsessile or with pedicels up to 5 mm. long, erect or spreading but not distinctly reflexed; leaves tending to be congested on the outer half of the branches.

Corolla 10–15 mm. long; leaf-blades obtuse or rounded, contracted into a slender petiole 1–5 mm. long, thick and very fleshy.....26. *N. aplocaryoides.*

Corolla 20–25 mm. long; leaf-blades acute, contracted into a slender petiole 6–8 mm. long, distinctly compressed.....27. *N. Pearcei.*

Mature calyces borne on slender sharply deflexed petioles 6–14 mm. long; leaves more equitably distributed over the plant.

Nutlets strongly and irregularly rugose, angular.

Leaf-blades ovate to deltoid-ovate, 4–10 mm. broad, abruptly contracted into a slender petiole.
28. *N. Weberbaueri.*

Leaf-blades narrowly oblanceolate, 2–3 mm. broad, gradually contracted into the petiole.....29. *N. laxa.*

Nutlets smooth or practically so, globose.

Plant glabrous or nearly so; leaves linear; corolla 2–3 times length of calyx; nutlets 5.....30. *N. gracillima.*

Plants villous; leaves broadly oblanceolate; corolla only shortly surpassing the calyx; nutlets 5–10. 31. *N. platyphylla.*

Plant perennial and more or less evidently shrubby, a few species short-lived and flowering the first year but these prostrate.

Calyx-tube at anthesis cylindrical, lobes only about half length of tube.

Calyx and foliage dry and glabrous; low spreading shrub. 32. *N. flaccida.*

Calyx and foliage with slimy hairs; erect bush ca. 1 m. tall. . . . . 33. *N. mollis.*

Calyx-tube at anthesis cupulate or rarely if more elongate the lobes evidently more than half the length of the tube.

Calyx-tube completely investing the ripening nutlets and finally irregularly disrupted by them. . . . 34. *N. tarapacana.*

Calyx-tube not investing the nutlets nor disrupted by them.

Corolla-lobes deeply notched, the corolla appearing to be 10-lobed. . . . . 35. *N. linearifolia.*

Corolla-lobes rounded or only obscurely notched, the corolla evidently 5-lobed.

Base of filaments thickened and very densely pubescent.

Plant glabrous or with simple hairs.

Branchlets distinctly pubescent; leaves spathulate. . . . . 36. *N. salsoloides.*

Branchlets quite glabrous; leaves broadly clavate.

Plant yellow-green; corolla blue. . . . 37. *N. divaricata.*

Plant glaucous; corolla white. . . . . 38. *N. glauca.*

Plant covered with forked or stellate hairs; corolla white.

Leaves broadly clavate, from the short petiole abruptly expanded into an ovoid or globose blade. . . . . 39. *N. peruviana.*

Leaves spathulate, gradually expanded upwardly towards the apex.

Plant with erect or ascending stems; commonly a bush a meter or more high; nutlets usually 4.

Corolla twice length of calyx, 10–13 mm. long; leaves 5–11 mm. long. . . . 40. *N. albescens.*

Corolla only slightly surpassing calyx, 7–8 mm. long; leaves 15–25 mm. long. 41. *N. Wedermannii.*

Plant with lank prostrate stems.

Corolla 11–13 mm. long; leaves 12–32 mm. long; nutlets usually 5; central Chile. 42. *N. crassulifolia.*

Corolla 6–10 mm. long; leaves 6–18 mm. long; nutlets usually 4; northern Chile. . . . . 43. *N. incana.*

Base of filaments not thickened, glabrous or only sparsely pubescent.

Indument entirely of branched or stellate hairs.

Leaves spathulate or oblanceolate, narrowed at base; indument dense, felty; Peruvian 44. *N. pallida.*
Leaves linear or oblong, not narrowed at base; indument loosely and softly tomentose; Chilean . . . . . 45. *N. villosa.*
Indument prevailingly or entirely of simple hairs.
Leaves and young twigs with short-stiped glands or with well developed stiffish erect usually gland-tipped hairs, never tomentose.
Herbage bearing short-stiped glands; erect bushes.
Corolla-tube slender, very long exserted, twice length of calyx; Peru . . . . 46. *N. lycioides.*
Corolla-tube stout, shorter than calyx; Chile.
Calyx strongly deflexed in fruit . . . . 47. *N. deflexa.*
Calyx erect or ascending in fruit.
Leaves very succulent, sparsely glandular; a dense globose bush with very numerous spreading brittle branches . . . . . 48. *N. ramosissima.*
Leaves rather firm or at least not conspicuously succulent, densely glandular; bush irregular and not dense . . . . . 49. *N. clivicola.*
Herbage with evident erect hairs; sprawling shrubs.
Leaves 10–40 mm. long, 1–5 mm. broad; margins only very inconspicuously revolute . . . . . 50. *N. inconspicua.*
Leaves 3–8 mm. long, 1–2 mm. broad, margins usually conspicuously revolute. 51. *N. leptophylla.*
Leaves and young twigs with slender curved or flexuous hairs, usually more or less tomentose.
Corolla white; leaves glabrous above or nearly so; a bush usually ca. 1 m. tall. 52. *N. sedifolia.*
Corolla pink to blue; leaves hairy above; low spreading plants.
Corolla 6–10 mm. long.
Branchlets and leaves with conspicuous loose tomentum; leaves 2–4 mm. long, very numerous and crowded. 53. *N. diffusa.*
Branchlets and leaves with a minute inconspicuous pubescence; leaves 6–15 mm. long . . . . . 54. *N. foliosa.*
Corolla 12–18 mm. long.
Foliage densely glandular; a sprawling shrub from a strong root. 55. *N. tocopillensis.*
Foliage with few or no glands; plant loosely branched, prostrate, suffrutescent, short lived annuals or perennials.

Plant slender; corolla 10–13 mm. broad; leaves 5–13 mm. long, 1–2 mm. broad; tomentum tending to become arachnoid or almost wanting. 56. *N. confinis.*

Plant coarser; corolla 13–22 mm. broad; leaves 10–27 mm. long, 1–6 (–8) mm. broad; stems and leaves pilose, the hairs not much intertangled, never arachnoid. 57. *N. pilosa.*

1. **Nolana spathulata** R. & P.

Nolana spathulata Ruiz and Pavon, Fl. Peruv. **2:** 7, tab. 113a (1799); Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852).—Type said to have been collected at "Pongo et Atiquipa" by Tafalla.

Nolana bipartita Ruiz and Pavon, Fl. Peruv. **2:** 7 (1799).—Apparently a rejected tentative name for *N. spathulata.*

PERU: Known only from the department of Arequipa; originally given as from the province of Camaná, ca. lat. 16° 40′ S., but known to me only from the vicinity of Mollendo, lat. 17° S.

SPECIMENS EXAMINED: Mollendo, 20–200 m. alt., dry sandy places at lower edge of Loma Formation, corolla light blue, Oct. 1902, *Weberbauer 1500* (BD); in the quebrada near Chula, Mejia, 20 m. alt., Oct. 1923, *Guenther and Buchtien* 120 (Hamb.); Mejia, 40 m. alt., Nov. 1923, *Guenther and Buchtien 116* (Hamb.); Peru, *ex herb. Ruiz* (BD, K) and *ex herb. Pavon* (Deles).

I have seen copious authentic collections of this species, from the herbaria of Ruiz and of Pavon, at Kew, Genèva and Berlin. These are obviously merely parts of a single gathering. A comparison of them with the original illustration shows that plate to be one and a half to two times natural size but otherwise quite satisfactory. The species is closely related to *N. arenicola* of the Tacna region. It appears to develop 5 large nutlets and an equal number of wedge-like small ones which are fitted in between the bases of the major nutlets. The faces of the large nutlets are partially attached to the receptacle and partially to each other. It may be noted that Bruns, Mitt. Inst. Bot. Hamburg **8:** 72 (1929), has reported this plant as *N. revoluta.*

2. **Nolana arenicola** sp. nov.

Herba annua glandulari-puberulenta 1–4.5 dm. alta 3–5 dm. diametro; caulibus decumbentibus laxe ramosis fistulosis 2–4 mm. crassis, internodiis 1–5 cm. longis; foliis succulentis compressis subcostatis, lamina ovata vel late lanceolata 1–2.5(–3) cm. longa plana vel angustissime revoluta basi oblique obtusa vel rotunda vel acuta in petiolum gracilem 8–20 (saepe ca. 10) mm. longum abrupte con-

tracta; pedicellis gracilibus 5–20 mm. longis, maturitate rigidioribus decurvatis; corolla coerulea 2–3 (saepissime 2–2.5) cm. longa infundibuliformi, tubo ca. 5 mm. longo intus dense villuloso; filamentis 4–6 mm. longis immam ad basem sparse villulosis; calycibus in anthesi 10–15 mm. longis 3–4(–5) mm. crassis, 1–2-fidis, lobis 5 inaequalibus spathulatis viridi-costatis erectis apice in alabastro libris; calycibus maturis per fructum conspicue distentibus et demum disruptis ca. 8 mm. crassis; fructu ca. 8 mm. diametro ca. 5 mm. alto nuculis 5 majoribus et 5–10 nuculis minoribus constituto; nuculis angulatis rugosis 2–7 mm. longis dermate silicoso minute papillato tandem deciduo obtectis; gynobasi excavata ca. 3 mm. alto et crasso.

PERU: Sandy places about Tacna, dept. Tacna, lat. 18° S., and on the drier interior slopes of the coastal hills at Cachendo, in the Mollendo region, dept. Arequipa, lat. 17° S. CHILE: Specimens are at hand from "Arica" but these may have been collected in the valley above Arica or about the Peruvian town of Tacna, for which Arica is the port.

SPECIMENS EXAMINED: Cachendo, 1000 m., Oct. 14, 16 and Nov. 28, 1923, *Guenther and Buchtien 115, 110* and *123* (Hamb.); frequent on a flooded place near Tacna, 650 m. alt., plant subprostrate or ascending, herbage fleshy, corolla sky-blue, Aug. 1925, *Werdermann 730* (TYPE, Gray Herb; BD); sandhill near Tacna, 800 m. alt., a small fugitive annual, leaves fleshy, corolla sky-blue, Aug. 1925, *Werdermann 723* (G, BD); bare sandy hills near Tacna, 900 m. alt., fleshy, corolla sky-blue, Oct. 1890, *Woitschach 98* (BD); common and ornamental in the sandy water-courses in the valley, Tacna, small bushy growths ca. 3 dm. broad and 1 dm. tall, leaves fleshy, corolla bright blue, May 1891, *Woitschach 99* (BD); Tacna, erect bushy annual, 3–4.5 dm. tall, corolla lilac, Sept. 1864, *Pearce* (K); Arica, Dec. 1880, *P. Ortiga* (G).

Obviously related to *N. spathulata* but smaller throughout and having the leaf bases rounded or angulate and not cordate or reniform. It occurs to the south of its relative and is a plant, not of the coast but of the interior. The epicarp of the mature nutlets is a fragile loose glossy shell that breaks up and falling away exposes the dull rough endocarp. Throughly mature fruit of *N. spathulata* has not been seen, but probably is similar in general structure to that of *N. arenicola*. The material I have cited from Cachendo has been reported as *N. prostrata* by Bruns, Mitt. Inst. Bot. Hamburg **8**: 72 (1929).

3. **Nolana latipes** sp. nov.

Herba annua depressa glabra vel inconspicue villulosa et glandulosa; caulibus laxe ascendentibus vel decumbentibus 1–3 dm. longis fistulosis 2–4 mm. crassis laxe ramosis; foliis glabris minute inconspicueque

papillatis valde compressis oblanceolatis vel obovato-oblongis obscure costatis 7–18 mm. latis 2–4 cm. longis, paullo supra medium latioribus, basim versus gradatim attenuatis (vix evidenter petiolatis), 2–4 mm. late affixis, apice obtusis, margine planis; pedicellis ad anthesin 1–2 cm. longis ascendentibus, fructiferis plus minusve recurvatis vel deflexis 1.5–2.6 cm. longis; calycibus ad anthesin ca. 1.5 cm. longis 4–5 mm. crassis profunde bifidis inaequaliter 5-lobatis, lobis 2–5 mm. longis (apicibus in alabastris libris) ca. 1 mm. latis diadelphis et triadelphis; calycibus fructiferis conspicue divergenteque bipartitis; corolla coerulea infundibuliformi 1.5–2 cm. longa ca. 2 cm. diametro, tubo 1–1.5 mm. crasso 3–4 mm. longo intus dense villuloso; filamentis 3–6 mm. longis inaequalibus imam ad basim villosis; fructibus ca. 8 mm. crassis; nuculis nigris valde irregularibus rugosis angulatis ca. 10–20, majoribus saepissime 5 ca. 4 mm. longis facie interiore cicatricosis; receptaculo ca. 10-dentato, gynobasi 2–3 mm. crassa et alta conspicue 5-excavata ornato.

PERU: Known only from the region about Mollendo, dept. Arequipa, lat. 17° S.

SPECIMENS EXAMINED: Mollendo, dry sandy places at lower edge of Loma Formation 20–200 m. alt., flowers bright blue, Oct. 3, 1902, *Weberbauer 1498* (TYPE, herb. Berol.); Mollendo, *D. Safford K56* (K); Mejia, 30 m. alt., Oct. 23, 1923, *Guenther and Buchtien 114* (Hamb.); Cachendo, 650 m. alt., 1923, *Guenther and Buchtien 1568* (Hamb.).

This new species agrees with *N. pallidula* in having angulate, black, and very rugose nutlets. There are usually five large ones developed. These are attached broadly on their face and seated in sockets in the faces of the pyramidal gynobase. Smaller wedge-shaped nutlets are fitted in between, both above and below, the five principal nutlets. Material of this plant has been reported by Bruns, Mitt. Inst. Bot. Hamburg **8**: 72 (1929) as *N. paradoxa*.

4. **Nolana pallidula** sp. nov.

Planta glaberrima suffruticosa laxe decumbens 1–1.5 m. lata 1–1.5 dm. alta utvidetur annua; caulibus fistulosis succulentis laxe ascendenter ramosis 3–6 mm. crassis internodiis 1–6 cm. longis; foliis spathulatis vel angustissime oblanceolatis succulentibus 1.5–4 cm. longis 2–6 mm. latis papillis minutis abundantibus obtectis pallidulis paullo infra apicem in petiolum scarioso-marginatum ca. 2 mm. latum 2–9 mm. longum attenuatis apice late acutis; pedicellis ad anthesin 2 (1.5–3) mm. longis, fructiferis ascendentibus; corolla coerulea infundibuliformi 2–3 cm. longa ca. 18 mm. diametro, tubo intus dense villoso 5–6 mm. longo ca. 2 mm. crasso; filamentis 5–7 mm. longis linearibus compressis basim versus sparse villosis; calycibus carnosulis ad anthesin ca. 18 mm. longis ca. 6 mm. crassis 5-costatis in-

aequaliter 4–6 mm. longe 5-lobatis medium versus bifidis, lobis erectis; calycibus fructiferis per nuculas infra medium dilatatis mox disruptis; nuculis nigris lucentibus angulatis rugosis inaequalibus ca. 10–20, majoribus 4–5 mm. longis, minoribus inter basim majores affixis; receptaculo ca. 10-dentato gynobasi pyramidali ca. 3 mm. alta ornato.

PERU: Valley near Tacna, lat. 18° S.

SPECIMENS EXAMINED: Near Tacna, ca. 650 m. alt., flowers bright blue, loosely decumbent, forming patches 15 dm. broad, succulent, leaves silver gray, stems dark, Aug. 1925, *Werdermann 728* (TYPE, Gray Herb; BD); sand near Tacna, flowers dark blue, leaves very fleshy, plant becoming 15 cm. tall, Sept. 1890, *Woitschach* (BD); "Bolivia," annual, flowers blue, *Pearce 654* (K).

A loosely branched, sprawling, very succulent herb known definitely only from near Tacna. It is evidently related to *N. latipes* from the Mollendo region, but is a much more spreading and fleshy plant. The leaves are narrower, and have expanded scarious-margined bases. The calyx-lobes are fleshy with scarous margins. They are coarser and more rigid than in *N. latipes* and being erect and juxtaposed do not spread and reveal the clefting of the calyx as obviously as in that species.

5. **Nolana galapagensis** (Christoph.), comb. nov.

Periloba galapagensis Christophersen, Nyt Mag. Naturvid. **70:** 89 cum tab. (1932).—Indefatigable Island, *Rorud 15.*

ECUADOR: Known only from the Galapagos archipelago; Indefatigable, North Seymour, Brattle and Charles islands.

SPECIMENS EXAMINED: On rocks near the surf on North Seymour Island, densely branched broad shrub nearly a meter high, leaves thick and juicy, corolla white, June 12, 1932, *Howell 10002* (G, CA); rare on sand banks, Turtle Bay, Indefatigable Island, shrub 9 dm. tall, Jan. 1927, *B. Rorud 15* (US, ISOTYPE).

The nutlets of this species are biseriate. There are about 10 small nutlets, 1–2 mm. long, borne below the middle of the evident gynobase and 3–5 larger ones (2–2.5 mm. long) borne above them. The gynobase occupies much of the receptacle. It may be as thick as high or may be more or less distinctly compressed laterally.

In gross aspect, in habit of growth, in form of corolla, in fact, apparently in all details except the structure of its fruit, this plant suggests the Chilean species rather than the geographically nearer ones of Peru. The species is known only from the Galapagos Archipelago, just south of the Equator. It is by far the most northerly ranging species of the Family. Geographically the nearest relatives

are *Nolana humifusa* and *N. laxa*, both of the department of Lima in west central Peru in latitude 11° 20′ and 11° 30′ S. According to Mr. J. T. Howell, in lit., this species was collected by Stewart in the Galapagos Islands in 1905–06. The collections from Brattle and Charles islands, were reported by Stewart, Proc. Calif. Acad. Sci. ser. 4, **1**: 65 (1911), as follows,—"Aizoacea (?) sp. Sterile specimens of bushes 4–5 ft. high with succulent leaves were collected on Brattle Isl. and on the beach at Cormorant Bay, Charles Isl. The family is doubtful (nos. 1494, 1495)."

6. **Nolana Gayana** (Gaud.) Koch

Alibrexia Gayana Gaudichaud, Bot. Voyage Bonite, Atlas tab. 105 (1851–52).—Type not indicated.

Nolana Gayana (Gaud.) Koch, Ind. Sem. Berol. **1855**: appendix pg. 12 (1855?); Johnston, Contr. Gray Herb. **85**: 156 (1929).

PERU: Coastal hills in the department of Lima to the south of the Capital; extending down the coast to the hills about Lurin, lat. 12° 20′ S.

SELECTED SPECIMENS: Barranco, in dry sandy places at the lower edge of the Loma Formation, 50–200 m. alt., flower blue, Oct. 1902, *Weberbauer 1606* (BD); Tablada de San Juan, Feb. 1874, *Martinet 287* (Paris); Tablada de Lurin, *Mathews 836* (K) and *837* (K, BM); Lurin, prostrate on the dryer seaward slopes of sandy hills, flowers lavender blue, ca. 60 m. alt., Sept. 1923, *Macbride 5937* and *5991* (G, FM, BD).

A very distinctive and quite local species having its closest relative, probably, in the geographically far removed *N. intonsa* of Chile. The fruit consists of about five sharply angulate major nutlets and several or more minor nutlets that are wedged in between the bases of the major ones. I am judging Gaudichaud's species entirely upon the published plate. Fortunately, however, the species is a very distinct one and Gaudichaud's admirable illustration of it is quickly recognizable. Until the type is located we may suppose that it was probably collected by Claudio Gay in the repeatedly botanized area about Lurin.

Miers, Hooker London Jour. Bot. **4**: 508 (1845) and Ill. So. Am. Pl. **1**: 61 (1850), and Dunal, in DC. Prodr. **13**[1]: 17 (1852), who followed him, have described our plant under the name, *Alibrexia revoluta*, a synonym of *Nolana revoluta* R. & P. The latter species, to judge from the poor illustration, differs from *N. Gayana* in its glabrous herbage, evidently veined leaves, short pedicels, and more slender and acuminate calyx-lobes. In addition it is said to have come from Camaná, in southern Peru.

7. **Nolana intonsa** sp. nov.

Planta herbacea gracilis pilis flexuosis 1–1.5 mm. longis villosa minute inconspicueque glandulosa; caulibus decumbentibus 1–2 mm. crassis laxe 5–15 mm. longeque ramosis, internodiis 3–20 mm. longis; foliis anguste spathulato-linearibus 2–3 cm. longis 1–2 mm. latis planis haud evidenter carnosis 5–10 mm. infra apicem latioribus deinde caulem versus gradatim attenuatis apice obtusis; pedicellis gracilibus ascendentibus 1–4.5 cm. longis; calyce ad anthesin ca. 1 cm. longo nullo modo angulato, tubo cupulato ca. 4 mm. diametro ca. 3 mm. profundo, lobis cuneatis erectis imam ad basim ca. 2 mm. latis apice longi-acuminatis; corolla in sicco subviolacea infundibuliformi ca. 2 cm. longa et lata, tubo ad 5 mm. longo ca. 1 mm. crasso intus pubescente; filamentis inaequalibus 4 et 6 mm. longis; fructu ignoto.

CHILE: Iquique, prov. Tarapacá, lat. 20° 13′ S., Oct. 1904, *P. Martens* (TYPE, Gray Herb.).

A species much suggesting the Peruvian *N. Gayana* in gross habit, but differing in having long-attenuate calyx-lobes and an indument of slender elongate simple hairs rather than of short stellate ones. It is known only from the type which was collected at one of the ports on the Nitrate Coast of northern Chile, and is separated from *N. Gayana* by a geographical hiatus of over 1200 kilometers. The type of *N. intonsa* is in flower only. The ovary at anthesis, however, is quite like that of its suggested relative. In my paper on the Flora of the Nitrate Coast, Contr. Gray Herb. **85**: 156 (1929), the present plant was listed incorrectly as representing good *N. Gayana*.

8. **Nolana sessiliflora** Phil.

Nolana sessiliflora Philippi, Anal. Univ. Chile **91**: 32 (1895); Reiche, Anal. Univ. Chile **125**: 491 (1910) and Fl. Chile **5**: 419 (1910).—Type collected in the Sierra Esmeralda by San Roman.

Nolana sessilifolia Philippi ex Johnston, Contr. Gray Herb. **85**: 105 (1929), lapsu calami.

Periloba sessiliflora (Phil.) Johnston, Contr. Gray Herb. **85**: 105 (1929).

CHILE: A species of the desert interior, 25–125 km. inland, in the southern parts of the province of Antofagasta.

Philippi described a specimen from the Sierra Esmeralda which was just coming into flower. Reiche had flowers and fruit and mentions collections from the Sierra Esmeralda, lat, 25° 50′ S., long. 70° 35′ W., and El Chaco, lat. 25° 27′ S. and long. 69° 15′ W. At Berlin I have studied a specimen from Santiago bearing the following data in Reiche's script,—"*Nolana sessiliflora* Ph., El Chaco, 29 I." The root and

base of the stem of this species is unknown. It is probably an erect annual herb.

The fruit consists of about 10 erect nutlets arranged more or less evidently in two series. The gynobase is pyramidal and at least 1–2 mm. high and thick. The nutlets are obliquely and suprabasally attached. They are black and obscurely rugulose, consisting of five major ones, 3–4 mm. long, and 3–5 minor ones, 2–3 mm. long. The minor nutlets form the outer series, being wedged in between the bases of the major nutlets and joined only about the basal corners of the pyramidal gynobase.

In the specimen at Berlin the calyx becomes 16 mm. long and fully 10 mm. broad at the abruptly expanded base. The lobes are unequal, and joined only 2 mm. above the pedicel. The largest one is 4–5 mm. broad towards the base but is contracted and becomes ligulate and 2–2.5 mm. broad above the middle. The apex is quite obtuse. The short lobes are 10–12 mm. long. The herbage of the plant is minutely stipitate-glandular. It is not pubescent.

9. **Nolana parviflora** (Phil.) Phil.

Sorema parviflora Philippi, Fl. Atac. 44 and Viage Des. Atac. 10, 218 (1860).—Type collected at Caldera by Philippi.

Nolana parviflora (Phil.) Philippi, Anal. Univ. Chile **91:** 29 (1895).

Periloba parviflora (Phil.) Johnston, Contr. Gray Herb. **85:** 105 (1929).

Nolana parviflora Philippi, Anal. Univ. Chile **91:** 34 (1895); Reiche, Anal. Univ. Chile **125:** 494 (1910) and Fl. Chile **5:** 422 (1910).—"Prope Bandurrias invenit orn. Guill. Geisse; prope Caldera sat frequens."

CHILE: Sandy places in the province of Atacama, from Caldera south to Bandurrias, lat. 27° to 27° 50′ S.

MATERIAL EXAMINED: Rather common in fog-bathed area near Monte Amargo, ca. 200 m. alt., annual, corolla small and white, Oct. 1924, *Werdermann 460* (G, BM, BD); Caldera, *ex Philippi* as *N. parviflora* (US, K); Chile, *Philippi* (BD); Atacama Desert, *Morong 1167* and *1272* (NY).

A decumbent annual with small inconspicuous white corollas. The nutlets in size and surface-markings much suggest those in *N. baccata*. They are, however, not so angular as in that species being more plump and having an evident medio-longitudinal keel. About the apex of the nutlets the keel is frequently drawn out into a narrow erect wing. The nutlets in *N. parviflora* number 10–15 and because of their more plump form are not so closely fitted together as in *N. baccata*. Only two ill defined series of nutlets are discernible in the fruit.

10. **Nolana pterocarpa** Phil.

Nolana pterocarpa Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891); Post and Kunze, Lexicon 390 (1904).—Type not cited, but probably a duplicate of the following species.

Nolana pterosperma Philippi, Anal. Univ. Chile **91**: 27 (1895); Reiche, Anal. Univ. Chile **125**: 493 (1910) and Fl. Chile **5**: 421 (1910).—Type collected between Caldera and Copiapó, in Sept. 1885, by F. Philippi.

Periloba pterosperma (Phil.) Johnston, Contr. Gray Herb. **85**: 105 (1929).

Nolana debilis Philippi, Anal. Univ. Chile **91**: 29 (1895); Reiche, Anal. Univ. Chile **125**: 493 (1910) and Fl. Chile **5**: 421 (1910).—Type from Piedra Colgada.

Nolana pulchella Philippi ex Reiche, Anal. Univ. Chile **125**: 493 (1910) and Fl. Chile **5**: 421 (1910).—Published in synonymy of *N. debilis*.

CHILE: Sandy places in the Caldera—Copiapó area, prov. Atacama, lat. 27° to 27° 30′ S.

SPECIMENS EXAMINED: Sand in quebrada just northwest of Copiapó, 370 m., decumbent annual with blue corollas, Nov. 1925, *Johnston 5029* (G); Queb. Chanchoquin near Copiapó, Sept. 1885, *Gigoux* (G); Piedra Colgada, Sept. 1885, *ex Philippi* as *pterocarpa* (BD, BM); Caldera, *ex Philippi* as *N. debilis* (US, K, BD).

The fruit of this species consists of 5–10 major nutlets (4–6 mm. long) and fewer smaller ones wedged in between and fixed on the edge of the receptacle slightly below and outside the major ones. The black nutlets are laterally compressed and somewhat lenticular. The lateral faces are convex. The medio-longitudinal margin, except in the quarter occupied by the nutlet-attachment, is drawn out into an evident knife-like wing averaging ca. 1 mm. in width. Kuntze, l. c., appears to have been much impressed with this development and proposed the section *Pteronolana* for this species. The wing on the nutlets of *N. pterocarpa*, however, is merely an extreme development of a tendency well marked in the nutlets of *N. parviflora*.

Young plants of *N. pterocarpa* are strikingly similar to flowering juvenal forms of *N. baccata* and are frequently separated from them only with difficulty. The corollas in *N. pterocarpa*, however, are less deeply lobed than in *N. baccata* and the leaves tend to have a very much more broadly inrolled margin.

There is an unfortunate name-change required for this species. Philippi appears to have distributed duplicates of the original collection before he had published his name for them. There are reasons to believe that Wettstein, finding this distinct plant in the herbarium,

proceeded to use Philippi's tentative herbarium-name without first determining whether its author had previously published it. In finally proposing the species, four years later, Philippi seems to have altered the specific epithet. Wettstein's use of Philippi's herbarium-name is in a synoptical key where it has just enough descriptive matter to make it validly published. *Nolana pterocarpa* Phil. ex Wettst. is accordingly taken up. It is treated as practically an exact synonym of the subsequently well described *N. pterosperma* Ph.

11. **Nolana baccata** (Lindl.) Dunal

Alona baccata Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Gay, Fl. Chile **5**: 111 (1849); Reiche, Anal. Univ. Chile **125**: 500 (1910) and Fl. Chile **5**: 428 (1910).—Type collected by Bridges, no. 1322; originally given as from Coquimbo but in fact from between Copiapó and Huasco.

Nolana baccata (Lindl.) Dunal in DeCandolle, Prodr. **13**[1]: 14 (1852).

Periloba baccata (Lindl.) Johnston, Contr. Gray Herb. **85**: 105 (1929).

Gubleria baccata [? Lindl.] Gaudichaud, Bot. Voyage Bonite, Atlas tab. 104 (1851–52).

Sorema linearis Miers in Hooker, London Jour. Bot. **4**: 499 (1845) and Ill. So. Am. Pl. **1**: 52 (1850); Gay, Fl. Chile **5**: 106 (1849).—Type given as collected at Concepcion by Bridges, no. 1323; in fact from between Copiapó and Huasco and really Bridges no. 1322.

Nolana linearis (Miers) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 13 (1852); Reiche, Anal. Univ. Chile **125**: 490 (1910) and Fl. Chile **5**: 418 (1910).

? *Nolana Navarri* Philippi, Anal. Univ. Chile **91**: 30 (1895); Reiche, Anal. Univ. Chile **125**: 492 (1910) and Fl. Chile **5**: 420 (1910).—Type-material collected at the port of Tongoi by L. Navarro and near Carrizal by G. King.

Nolana stans Philippi, Anal. Univ. Chile **91**: 31 (1895); Reiche, Anal. Univ. Chile **125**: 488 (1910) and Fl. Chile **5**: 416 (1910).—Type collected at Piedra Colgada.

Periloba stans (Phil.) Johnston, Contr. Gray Herb. **85**: 105 (1929).

Nolana Carrera Philippi, Anal. Univ. Chile **91**: 31 (1895); (*N. carrerae*) Reiche, Anal. Univ. Chile **125**: 492 (1910) and Fl. Chile **5**: 420 (1910).—Type-material from near Copiapó and Huasco.

Nolana alba Philippi, Anal. Univ. Chile **91**: 32 (1895).—Type-material cited, "Primum de Bandurrias prope Chañarcillo a Guilielmo Geisse accepi, prope Caldera frequens."

Nolana leucantha Philippi, Anal. Univ. Chile **91**: 34 (1895).—Type collected by Geisse near Caldera.

Nolana Carrerae var. *leucantha* (Phil.) Reiche, Anal. Univ. Chile **125**: 492 (1910) and Fl. Chile **5**: 420 (1910).

CHILE: Sandy places in the province of Atacama; known definitely from along the coast, from Caldera to Carrizal, and inland to Piedra Colgada and Bandurrias, lat. 27° to 28° 10′ S. Beyond this range it has been reported from between Paposo and Taltal, from about Huasco, and from the provinces of Coquimbo and Aconcagua.

SPECIMENS EXAMINED: Sandy plains and hills between Copiapó and Huasco, annual ca. 15 cm. tall, flowers white, *Bridges 1322* (Lindl.); "Conception, *Bridges 1323*" (K); fog-bathed area near Monte Amargo, ca. 200 m. alt., corolla white or rarely bluish, plant somewhat viscid, Oct. 1924, *Werdermann 444* (G, BD); vicinity of Caldera, *Gigoux* (G); Atacama Desert, *Morong 1137* and *1373* (NY); Atacama, *ex Philippi* as *N. Carrerae* (US, BD, K); Atacama Desert, *Geisse 13* (NY); Piedra Colgada, Sept. 1885, *Philippi* as *N. stans* (BM); Atacama, *ex Philippi* as *N. stans* (K, BD); Carrizal, 1885, *King* as *N. Navarri* (BD).

The types of *Alona baccata* Lindl. and *Sorema linearis* Miers are duplicates of a collection made by Bridges! A study of Bridges manuscript plant-list shows conclusively that both types should bear Bridges' no. 1322 and that both specimens came from between Copiapó and Huasco. Miers has cited this number as 1323, but that properly belongs to the type-collection of *Alona ericifolia*, a synonym of *Alona coelestis!* Philippi's *N. alba* and *N. leucantha* are evident synonyms of *N. baccata*. All three of these species are based upon the common form of this plant having white corollas and very glandular herbage. Philippi's *N. stans* seems to be an uncommonly smooth and sparsely glandular form. *Nolana Navarri* Phil., at least in part, is like the common typical form of *N. baccata*, but has bright blue corollas. *Nolana Carrera* Phil. is described as having corollas which are a beautiful blue with white in the throat, though as having "una variedad con flores enteramente blancas". In his field notes, appended on the sheet of his collection no. 444 at Berlin, Werdermann states that the corolla is "weiss, selten blaulich." It seems, therefore, that though *N. baccata* has prevailingly white flowers it occasionally, at least, may have blue or bluish ones as well.

Philippi's *N. Navarri* is given as based upon material collected by Navarro, near Bahia de Tongi, prov. Coquimbo, lat. 30° 15′ S., and by King at Carrizal. There is a specimen at Berlin from Philippi labeled *N. Navarri* and as collected at Carrizal by King. It is the blue-flowered form of *N. baccata*. Unfortunately I have seen no material collected by Navarro. Since the species is named for him it is logical to treat his collections as type of the species. The fact that Navarro's collections came from Tongoi Bay to the south of the

port of Coquimbo and far to the south of the indubitable range of *N. baccata* makes me feel that his collection probably represents another species, perhaps even *N. acuminata.*

It is perhaps unnecessary to note that the fruit of *N. baccata* is not baccate. It consists of 20–25 small (mostly 1–2.5 mm. thick) irregularly angulate and polyhedral nutlets that are closely fitted in 2–3 very ill defined ranks to form a globose mass ca. 5 mm. in diameter. The individual nutlets are angular and lacunose and no more baccate than in other congeners. Gaudichaud illustrates the nutlets as irregularly lobed or with a well developed horizontal wing encircling their middle. I greatly doubt the accuracy of these details on this otherwise admirable plate. All collections examined by me have the simple angulate, irregularly polyhedral nutlets described. Bridges collection (no. 1322) of this species was no doubt available to Gaudichaud, and in all probabilities was the only one, and, hence, almost certainly that illustrated by him. I have found no suggestion of winged nutlets in any of the several duplicates of this collection examined by me.

In the British Museum there is a specimen, which may represent *N. baccata,* that is accompanied with a label giving it to be *Cuming 856* from "Coquimbo." The specimen is a small annual herb showing basal leaves and flowers but no fruit. I am not only unable to identify the plant with certainty but furthermore must question its data. The number given is that of the type-collection of *Sorema lanceolata* Miers which is certainly a different plant.

12. **Nolana Jaffuelii** sp. nov.

Herba annua glaberrima eglandulosa; caulibus pluribus decumbentibus 1–3 dm. longis simplicibus vel sparse laxeque ramosis fistulosis 2–3 mm. crassis; foliis medio-costatis aliquantum succulentis ubique vesiculis minutis ornatis; foliis basalibus vix persistentibus oblanceolatis conspicue petiolatis, lamina 8–15 mm. latis 3–6 cm. longis apice obtusis infra medium in petiolum 2–4 mm. longum gradatim attenuatis; foliis caulinis mediis et superioribus oblique lateque sessilibus conspicue decurrentibus haud auriculatis, lamina oblonga lanceolata vel ovata 2–4 mm. longa 6–12 mm. lata; pedicellis floriferis 1–3 cm. longis, fructiferis rigidioribus ascendentibus; calycibus ad anthesin 8–10 mm. longis angulatis, tubo 5–6 mm. crasso ca. 3 mm. profundo infra sinus plicato, lobis triangularibus acuminatis, fructiferis ca. 1 cm. crassis; corolla infundibuliformi coerulea 13–20 mm. longa calyce longiore et saepissime duplo longiore; filamentis inaequalibus; nuculis ca. 3-seriatis 1–3 mm. crassis pallidis angulatis lacunosis.

CHILE: Gravelly slopes on the coastal hills in the provinces of

Tarapacá and Antofagasta, lat. 19° 50′ south to 22° 5′ S. PERU: Near Tacna.

SPECIMENS EXAMINED: Caleta Buena, 1902, *Paessler* (BD); Iquique, Nov. 1914, *Rose 19448* (US, NY); Quebrada de Huantajaya, Iquique, ca. 700 m. alt., Sept. 1925, *Werdermann 757* (G, BD); lomas, Iquique, 900 m., *Bollaert* (BM); gravelly slope in hills near Tocopilla, somewhat fleshy herb, decumbent, flowers blue, Oct. 18, 1925, *Johnston 3604* (TYPE, Gray Herb.); Tocopilla, Oct. 1930, *Jaffuel 1004, 1035* and *1036* (G). PERU: Hills near Tacna, one plant, prostrate annual, leaves with watery pustules, flowers blue, Sept. 1864, *Pearce* (BM).

A well marked plant probably most closely related to *N. elegans* of the fertile slopes in the Paposo region. From that species, however, it is quickly separable by being an annual herb, smaller throughout and quite glabrous. From *N. acuminata*, forms of which have been collected at least as far north as Antofagasta, it is separated at once by its conspicuously decurrent upper leaves and quite glabrous herbage. In my report on the flora of the Nitrate Coast, Contr. Gray Herb. **85**: 156 (1929), I treated this species as a form of *Periloba longifolia*.

13. **Nolana elegans** (Phil.) Reiche

Sorema elegans Philippi, Fl. Atac. 43 (1860) and Viage Des. Atac. 16, 17, 25, 38, 217 (1860).—Type collected by Philippi in hills above Paposo.

Nolana elegans (Phil.) Reiche, Anal. Univ. Chile **125**: 487 (1910) and Fl. Chile **5**: 415 (1910).

CHILE: On rich fog-bathed slopes of the coastal hills from the Paposo region north to about Miguel Diaz, prov. Antofagasta, lat. 24° 35′ to 25° 5′ S.

SPECIMENS EXAMINED: El Rincon near Paposo, succulent herb of the fertile belt, prostrate or clambering through bushes, corolla blue, Dec. 1925, *Johnston 5511* (G); grassy slopes in fertile belt above Ag. Miguel Diaz, decumbent rather succulent herb, Dec. 1925, *Johnston 5383* (G).

The type of this species was collected by Philippi on the fog-bathed slopes near Paposo. It is a conspicuous and beautiful plant with the rich blue corollas becoming 5 cm. long. The upper cauline leaves are obliquely sessile and, on one side only, have a conspicuous attenuate decurrent base becoming a centimeter long.

14. **Nolana rupicola** Gaud.

Nolana rupicola Gaudichaud, Bot. Voyage Bonite, Atlas tab. 28 (1841); Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852).—Type not designated.

Alona longifolia Lindley, Bot. Reg. **30**: sub tab. 46 (1844).—Type collected at Coquimbo by Cuming, no. 887.

Sorema longifolia (Lindl.) Miers, Hooker London Jour. Bot. **4**: 498 (1845) and Ill. So. Am. Pl. **1**: 52 (1850); Gay, Fl. Chile **5**: 106 (1849).

Nolana longifolia (Lindl.) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 12 (1852); Reiche, Anal. Univ. Chile **125**: 491 (1910) and Fl. Chile **5**: 419 (1910).

Periloba longifolia (Lindl.) Johnston, Contr. Gray Herb. **85**: 104 and 156 (1929).

? *Nolana triquetra* Koch and Bouché, Ind. Sem. Hort. Berol. **1855**: appendix pg. 12 (1855?).—Based upon garden material probably grown from seeds collected in northern Chile by Philippi in 1853–54.

Sorema bracteosa Philippi, Fl. Atac. 43 (1860) and Viage Des. Atac. 217 (1860).—Type collected at Cachinal de la Costa by Philippi.

Nolana bracteosa (Phil.) Reiche, Anal. Univ. Chile **125**: 489 (1910) and Fl. Chile **5**: 417 (1910).

Sorema glutinosa Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 10, 218 (1860).—Type collected near Caldera by Philippi.

Nolana glutinosa (Phil.) Reiche, Anal. Univ. Chile **125**: 489 (1910) and Fl. Chile **5**: 417 (1910).

Sorema lanceolata sensu Gaudichaud, Bot. Voyage Bonite, Atlas tab. 102 (1851–52).

? *Nolana lanceolata* sensu Hooker, Bot. Mag. **88**: tab. 5327 (1862).

CHILE: Rocky places near the coast, from the prov. Aconcagua north to the southern boundary of the prov. Antofagasta, lat. 33° to 26° S.

SELECTED SPECIMENS: Valparaiso, 1832, *Gaudichaud* (Del.); Coquimbo, *Werdermann 112* (G); Coquimbo, *Cuming 887* (K); Huasco, *Jaffuel 1182* (G); Caldera, *Gigoux 30* (G); Chañaral, rocky places on fog-bathed crest, perennial with decumbent stems, *Johnston 4768* (G); headlands near Aguada Grande (i.e. Cachinal de la Costa), 1925, *Johnston 5770* (G).

The present plant is evidently related to *N. acuminata* and has a range very similar to that species. It is, however, a coarser plant which tends to have a shrubby perennial base. The herbage is abundantly stipitate glandular, as well as frequently short hairy. This glandularity makes the herbage of *N. rupicola* a duller green than in its more hairy, but much less glandular or even quite glandless relative. The coarser leaves in *N. rupicola* are, also, not only more elongate and strap-shaped than in *N. acuminata*, but furthermore tend to have a subauriculate somewhat amplexicaul base. In *N. acuminata* the bases are not rounded off but, instead, abruptly short-decurrent. Our species appears to be a plant of fog-bathed cliffs and rocky places along the coast. Its relative seems to be an annual herb

frequenting sandy or gravelly locations. The nutlets of *N. rupicola* are indistinguishable from those of *N. acuminata*. They are 1–3 mm. long and more or less angulate and somewhat lacunose. The pericarp is thin.

15. **Nolana acuminata** Miers

Sorema acuminata Miers, Hooker London Jour. Bot. **4**: 370 (July 1845) and Ill. So. Am. Pl. **1**: 51 (1850); Gay, Fl. Chile **5**: 105 (1849).—Type originally cited "ad Concepcionem (v. s. in Herb. Hook, no. 1322)," but actually *Bridges 1325* from near coast at Coquimbo.

Nolana acuminata (Miers) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 12 (1852); Reiche, Anal. Univ. Chile **125**: 491 (1910) and Fl. Chile **5**: 419 (1910).

Sorema lanceolata Miers, Hooker London Jour. Bot. **4**: 498 (Sept. 1845) and Ill. So. Am. Pl. **1**: 51 (1850); Gay, Fl. Chile **5**: 105 (1849).—Type from Coquimbo, *Cuming 856*.

Nolana lanceolata (Miers) Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 12 (1852); Reiche, Anal. Univ. Chile **125**: 490 (1910) and Fl. Chile **5**: 418 (1910).

? *Nolana angustifolia* Philippi, Linnaea **29**: 26 (1857); Reiche, Anal. Univ. Chile **125**: 488 (1910) and Fl. Chile **5**: 416 (1910).—Type collected near Coquimbo by Gay.

? *Nolana rupestris* Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3, fig. 1 (1891); Philippi, Anal. Univ. Chile **91**: 28 (1895); Reiche, Anal. Univ. Chile **125**: 489 (1910) and Fl. Chile **5**: 417 (1910).—Type collected at Curauma near Valparaiso.

Nolana napiformis Philippi, Anal. Univ. Chile **91**: 30 (1895); Reiche, Anal. Univ. Chile **125**: 488 (1910) and Fl. Chile **5**: 416 (1910).—Type-material collected by Philippi near Coquimbo and La Serena.

Nolana grandiflora Herzog, Meded. Rijks Herb. **29**: 21 (1916); not Lehmann (1837).—Type collected near Antofagasta, *Herzog 2457*.

Sorema longifolia sensu Gaudichaud, Bot. Voyage Bonite, Atlas tab. 103 (1851–52).

CHILE: Gravelly places near the coast from the Valparaiso region north to the vicinity of Antofagasta, lat. 33° to 23° 30′ S.

SELECTED SPECIMENS: Limari, Fray Jorge, 100 m. alt. *Werdermann 893* (G); Coquimbo, *Cuming 856* (K); near coast, Coquimbo, *Bridges 1325* (K); Carrizal bajo, *King* (K); Chañaral on hillside, *Johnston 4769* (G); Taltal, 100 m., *Werdermann 769* (G); Antofagasta, *Johnston 3638* (G).

Although the type-specimen of *N. acuminata* bears Bridges' number 1322, a study of the collector's catalogue makes it evident that the number should be 1325 and that it was collected near the coast at Coquimbo. Neither this specimen, nor *Cuming 865*, which is the type of the apparently synonymous *S. lanceolata*, show the root.

This is unfortunate since some plants of the present species from the coast of Coquimbo have coarse, corky, carrot-like roots. Philippi's *N. napiformis* is such a plant. I have a strong suspicion that the underground parts of the type of *N. lanceolata* were also similarly thickened. Some material from Coquimbo, however, and practically all that from farther north, has normal slender fibrous roots. There are usually 10–15 nutlets developed. These are usually angular and wedged in and closely fitted together in about 2 ill-defined series. The northern collections of this species appear to have somewhat fewer and less roughened nutlets than do those from the south.

The plants I have treated under the names *N. rupicola* and *N. acuminata* are variable and have an uncommonly wide distribution. I shall not be surprised if they prove to be aggregates composed of critical species of limited distribution. Their present treatment is confessedly unsatisfactory. A careful study of them, particularly in the field, is much needed.

16. **Nolana paradoxa** Lindl.

Nolana paradoxa Lindley, Bot. Reg. **10**: tab. 865 (1825) and Trans. Hort. Soc. **6**: 296 (1826); Sims, Bot. Mag. **52**: tab. 2604 (1825), plate only; Dunal in DeCandolle, Prodr. **13**[1]: 11 (1852); Guppy, Observ. Naturalist in the Pacific **2**: 477 and 596 (1906); Reiche, Anal. Univ. Chile **125**: 486 (1910) and Fl. Chile **5**: 414 (1910).—Based upon garden material raised from Chilean seed received from Miers.

Periloba paradoxa (Lindl.) Rafinesque, Fl. Tellur. **4**: 87 (1838); Johnston, Contr. Gray Herb. **85**: 105 (1929).

Sorema paradoxa (Lindl.) Lindley, Bot. Reg. **30**: sub. tab. 46 (1844); Miers, Hooker London Jour. Bot. **4**: 369 and 502 (1845) and Ill. So. Am. Pl. **1**: 49, tab. 10 (1850); Gay, Fl. Chile **5**: 103 (1849).

Nolana atriplicifolia D. Don ex Sweet, Brit. Fl. Garden, ser. 2, **4**: tab. 305 (1835); G. Don, Gen. Syst. **4**: 479 (1837); Gay, Fl. Chile **5**: 104 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 11 (1852); Reiche, Anal. Univ. Chile **125**: 487 (1910) and Fl. Chile **5**: 415 (1910); Saunders, Jour. Genetics **29**: 387–419, tab. 33, fig. 1–6 (1934).—Based upon garden material.

Sorema atriplicifolia (D. Don) Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Miers, Hooker London Jour. Bot. **4**: 369 (July 1845).

Sorema paradoxa var. β *atriplicifolia* (D. Don) Miers, Ill. So. Am. Pl. **1**: 50 (1850).

Nolana grandiflora Lehmann ex G. Don, Gen. Syst. **4**: 479 (1837).—In synonymy of *N. atriplicifolia.*

Sorema litoralis Miers, Hooker London Jour. Bot. **4**: 370 (July 1845) and Ill. So. Am. Pl. **1**: 50 (1850); (*S. littoralis*) Gay, Fl. Chile **5**: 104 (1849); Philippi, Linnaea **33**: 207 (1864).—Original material from

Valparaiso, collected by Mathews, Cuming (no. 627) and Bridges (no. 327).

Nolana littoralis Miers ex Dunal in DeCandolle **13**[1]: 12 (1852).

? *Nolana paradoxa* β *glaberrima* Dunal in DeCandolle, Prodr. **13**[1]: 11 (1852).—Type given as "v. v. in hort. Monsp."

Nolana atriplicifolia β *cuneifolia* Dunal in DeCandolle, Prodr. **13**[1]: 12 (1852).—Type collected near Quintero by Bertero, no. 1183.

Nolana paradoxa var. *violacea* Van Houtte, Fl. des Serres **13**: 7, tab. 1294 (1858).—A garden color-form.

Nolana atriplicifolia var. *subcorulea* hort., Floral Mag. **2**: tab. 128 (1862).—A horticultural color-form.

Sorema petiolata Philippi, Linnaea **33**: 207 (1864).—Type from near Corral.

Nolana petiolata (Phil.) Reiche, Anal. Univ. Chile **125**: 493 (1910) and Fl. Chile **5**: 421 (1910).

Nolana ochrocarpa Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3, fig. 1 (1891); Philippi, Anal. Univ. Chile **91**: 33 (1895); Reiche, Anal. Univ. Chile **125**: 486 (1910) and Fl. Chile **5**: 414 (1910).—Type from San Vicente near Talcahuano.

Nolana geminiflora Philippi, Anal. Univ. Chile **91**: 27 (1895).—Type collected at Algarrobo in April 1881.

CHILE: Coastal sands from Quintero, prov. Aconcagua, lat. 32° 45′ S., along the seashore south to the Island of Chiloe, ca. lat. 42° 40′ S., and, according to Reiche, along Chilean Patagonia to the mouth of the Rio Aysen, lat. 45° 20′ S. Reiche reports it "desde la provincia de Coquimbo hasta la boca del rio Aysen; en el interior hasta Quillota" Quillota is 25 km. up the Aconcagua Valley.

This species was the second member of the Nolanaceae to reach European gardens. The original seeds were sent Francis Place by John Miers, then in Chile, and appear to have been received about 1822. They were almost certainly collected on the sea-shore at Concon, near where Miers resided in Chile.

The plant is notable for several peculiarities of habit. Ranging along the whole coast of central Chile south to Chiloe and even somewhat beyond, it is the sole member of the family south of the Valparaiso area. The species, hence, sets the southern limit in the area of dispersal of the Nolanaceae. Although the members of the family practically all occur near, along, or at least at no great distance from the sea, only two species have selected the sandy sea-shore as habitats. These are *Nolana thinophila*, local in southern Peru, and *Nolana paradoxa*, widely distributed along central Chile. The latter is evidently the more successful and has various characteristic adaptations for the strand habitat and tidal dispersal. It has a deep fleshy tap-root. The elongate stems are prostrate and freely and loosely branched.

The herbage is quite succulent. The plant roots readily in gardens and it is quite probable that the readily detached branches of the plant, washed about by the waves and currents probably aid in the dispersal of the plant through this vegetative means. The nutlets are provided with a thick corky epicarp. The buoyant nature of these nutlets, and the ease with which detached leafy stems can be spread by ocean currents, lead one to wonder, in fact, why *N. paradoxa* has not even a wider distribution along the coastal sands.

The nutlets have rounded angles and are 3–6 mm. long. The faces are nearly smooth. In all mature specimens from wild plants examined by me, the nutlets have a conspicuous corky pericarp. Such writers as Guppy, Obs. Nat. Pacific **2**: 477 and 596 (1906), and Miers, Hooker London Jour. Bot. **4**: 369 (1845), who have studied the plant on the Chilean beaches, both report the corky pericarp as normal for the species. Philippi, however, described it as characteristic of his newly proposed *N. ochrocarpa*. While I believe we may safely assume that the corky nutlets of *N. paradoxa* are characteristic of that species under normal conditions, it must be noted that in garden material the nutlets are not only smaller but also tend to have the corky layer poorly developed.

This species, along with the Peruvian *N. humifusa* (= *N. prostrata*) has been the subject of breeding experiments by Miss Saunders, Journ. Genetics **29**: 387–419 (1934). Certain matters of concept and nomenclature in her interesting paper, however, need some comment. For the present Chilean species she has accepted the name "*N. atriplicifolia*," for some reason attributing the name to "hort." although admitting that it was proposed by Don. Her usage of the name "*N. paradoxa*" is involved. There is the original "*N. paradoxa* Lindl." which was described and illustrated in the Botanical Register (tab. 865) and there is the "*N. paradoxa* Hook." which she sometimes applies to the plate (tab. 2604) in the Botanical Magazine (which is good *N. paradoxa* Lindl.), and sometimes to the plant discussed in the text accompanying plate 2604 (which is *N. tenella* Lindl.). She finally concludes that not only *N. tenella* Lindl., but both of her usages of *N. paradoxa* apply to simple or complex natural hybrids of *N. atriplicifolia* and *N. prostrata*.

The plant illustrated on plate 2604 of the Botanical Magazine was drawn May 1823 from plants obtained from Place who had imported them from Miers in Chile. Since Place's importations were made about 1822 and were the first of our Chilean plant made into Europe, it is evident that the *Nolana* was illustrated during its first or second

growing season in England. Lindley's plate, accompanying the original description of *N. paradoxa*, was based upon plants growing in 1824, which had also been obtained from Place. Concerning these two plates I believe that, whatever differences there are between them, they represent plants, slightly modified by cultivation, from the same, then very recent importations by Place, and that they originated in central Chile and in all probability near Concon where Miers then resided. Could these plants have been natural or even garden hybrids of the Chilean plant and the Peruvian *N. humifusa*?

There are several difficulties in the acceptance of Miss Saunders' theory of the hybrid origin of *N. paradoxa*. Any possibility of it being a natural hybrid of the Chilean plant and *N. humifusa* is quickly eliminated. Not only do the two supposed parents have very different habitats, one affecting coastal beaches and the other the fog-bathed middle and upper slopes of the coastal hills, but they have widely dissevered ranges as well, being separated by at least 2500 km. (1500 miles) and over 18 degrees of latitude. The literary sources from which Miss Saunders found reason for believing the two species have over lapping ranges are simply incorrect! Miss Saunders states that *N. atriplicifolia* is a pure species and one of the parents, in a natural cross with *N. humifusa*, that gave rise to *N. paradoxa*. A study of the history of *N. atriplicifolia*, however, casts further doubt on this hypothesis. The supposed parent is definitely stated to have been introduced into England from "Peru" in 1834, that is to say over a decade subsequent to the appearance of its supposed hybrid, *N. paradoxa*. Since the possibilities that *N. paradoxa* was a wild hybrid have been completely eliminated, and since true *N. atriplicifolia* Don has been shown to have been not available for a chance garden hybrid with *N. humifusa* when *N. paradoxa* first appeared in England, we are forced to one of two conclusions. Either the plants illustrated as *N. paradoxa* were pure strains of the Chilean plant (as *N. atriplicifolia* is assumed to be by Miss Saunders), or they represent chance garden hybrids of the Peruvian, *N. humifusa*, and a pure strain of the Chilean plant, in the two or three years subsequent to Place's introduction of the latter into English gardens. I am of the opinion that the first alternative is correct.

Miss Saunders has demonstrated that *N. tenella* Lindl. is a hybrid of the Chilean plant and the Peruvian *N. humifusa*. She has remarked, however, that the two parents are readily self-fertile but that "When bred together they show a very high degree of sterility. Out of many dozens of cross-fertilizations . . . only five yielded viable seeds

. . ." The hybrid, *N. tenella*, is the uniform recurrent progeny of the reciprocal crosses of the Chilean and Peruvian species. This F_1, beautifully illustrated by Miss Saunders, is very different from *N. paradoxa* and not to be at all confused with it. She believes, therefore, that *N. paradoxa*, is a "derivative of the mating of atriplicifolia ♀ × prostrata ♂" and the result of several generations of back breeding with *atriplicifolia*. The belief of Miss Saunders that *N. paradoxa* was heterozygous might be accepted were there any possibilities that it might have been a wild hybrid. But with this eliminated her theory demands a complex garden hybrid and that, while barely within the realms of possibility, actually seems incredible when one considers the very few years it had been in cultivation before Lindley described and illustrated this supposed hybrid. Miss Saunders has remarked on the resistance of the two supposed parents to crossing, and this under the determined supervision of an interested geneticist. This physical handicap to chance crossing and the improbability of a newly imported Chilean plant, a novelty, being bedded at once with the then long known and though not widely cultivated species from Peru, makes the possibilities of a simple, not to mention a complex chance garden hybrid during the first few years subsequent to Place's introductions seem very remote indeed. Finally what seems positively incredible is that the editors of the Botanical Register and the Botanical Magazine would have passed over the only recently introduced pure Chilean plant, horticulturally an attractive one and botanically a most curious species, and centered their whole attention on what could have been at most only one or two chance hybrids scarcely separable from it. The plates in the Botanical Register and the Botanical Magazine represent, I believe, the pure Chilean stock uncontaminated by hybridization. The name *Nolana paradoxa* Lindl. is the correct and proper name for the well known species of the coast of central Chile.

17. **Nolana Adansoni** (R. & S.), comb. nov.

Tula Adansoni Roemer and Schultes, Syst. **4:** 355 (1819); DeCandolle, Prodr. **4:** 418 (1830); G. Don, Gen. Syst. **3:** 524 (1834).—Based on the following polynomial.

Soldanella facie, flore infundibuli forma, Feuillée, Jour. Observ. Phys. **2:** 15 (1725) and **3:** [Hist. Pl. Medicinal] 63, tab. 44 (1725).—Original specimens collected on coast just south of Ilo, Peru, by Feuillée.

Sorema cordata Remy, Ann. Sci. Nat. ser. 3, **6:** 351 (1846).—Type collected at Islay by d'Orbigny.

Nolana cordata (Remy) Dunal in DeCandolle, Prodr. **13**[1]: 13 (1852); Weberbauer in Engler and Drude, Veg. Erde **12**: 137, fig. 7a (1911); Bruns, Mitt. Inst. Bot. Hamburg **8**: 71 (1929).

PERU: Along coast of southern Peru, dept. Arequipa (Chala, Atico, Mollendo, Mejia and Islay) and dept. Moquegua (Ilo), lat. 15° 50′ to 17° 35′ S. Records from Tacna, lat. 18° S., need verification.

MATERIAL EXAMINED: Vicinity of ports of Chala and Atico, dry places, plant erect, exuding water over all the surface of the stem, corolla violet becoming blue in drying, Nov. 1863, *Raimondi 11779* (BD); Mollendo, dry sandy places at lower edge of Loma Formation, 20–100 m. alt., flowers sky blue, Oct. 1902, *Weberbauer 1481* (BD, Deles); Mollendo, June 1903, *Hill 342* (K); Mollendo, 1932, *Stafford K29* (K); Islay, 1833, *d'Orbigny* (TYPE, Paris); among rocks near the ocean at Mejia, 10 m. alt., white-flowered, Nov. 9, 1923, *Guenther and Buchtien 111* (Hamb); among rocks near ocean at Mejia, 10 m. alt., normal blue-flowered form, Nov. 6, 1923, *Guenther and Buchtien 109* (Hamb); "Tacna," erect annual with smooth stems, flower blue, Sept. 1864, *Pearce* (BM).

This species was first described and illustrated under a phrase-name by Feuillée, who collected it August 29, 1710, in a rocky place along the shore a few kilometers south of the port of Ilo. The generic name, *Tula*, was proposed by Adanson in 1763 and was founded directly and exclusively upon the description published by Feuillée in 1725. No specific name having been porposed, one was supplied by Roemer and Schultes in 1819. The resulting binomial, *Tula Adansoni*, is the oldest name for this remarkable plant. Feuillée's collection remained the only one known until 1833 when d'Orbigny rediscovered the species at Islay. In 1846 this new material was described by Remy under the name, *Sorema cordata*. A note appended to his description indicates that Remy believed that d'Orbigny's plant and that illustrated by Feuillée were conspecific. Remy, however, seems to have been unaware of Adanson's genus *Tula*. In 1852 Dunal pronounced *Tula* a synonym of Remy's species, and Adanson's genus, after nearly a hundred years as a dubious plant, questionably placed in the Rubiaceae, at last became associated with its proper family.

The fruit of this species consists of 15–20 nearly spherical nutlets. These are attached in 2–3 series to a well developed cartilaginous gynobase occupying the central half of the receptacle. The gynobase may be nearly as thick as high or may be much compressed laterally. The 3–5 nutlets borne about the summit of the gynobase are 1.5–2 mm. in diameter. The other nutlets, borne below them, are smaller being usually 1 mm. thick or less.

The species is a very distinct one. The reniform leaf-blades and the amplexicaul, stipuloid bases of the petioles are unique in the family.

18. **Nolana insularis** (Johnston), comb. nov.

Periloba insularis Johnston, Contr. Gray Herb. **95**: 32 (1931).—Type from San Gallan Island, *Murphy 3472*.

PERU: Known only from the type-station, on the fog-bathed crests of San Gallan Island, off the department of Ica, lat. 13° 55′ S.

A low spreading plant with a coarse loosely and widely branched, woody caudex. The stems are roughened with the evident corky persistent bases of old petioles. The herbage is covered with an indument of slender forked or dendritic hairs. The receptacle is occupied by a rounded gynobase bearing about 15 nutlets in 2–3 series. The nutlets about the apex of the gynobase, about 5 in number, are the largest.

19. **Nolana inflata** R. & P.

Nolana inflata Ruiz and Pavon, Fl. Peruv. **2**: 7, tab. 112a (1799); Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852).—Original material collected by Tafalla in the sandy hills near Pongo and Atiquipa.

Cacabus ? *inflatus* (R. and P.) Miers, Ann. and Mag. Nat. Hist. ser. 2, **4**: 255 (1849) and Ill. So. Am. Pl. **2**: 51 (1857).

Nolana ventricosa Ruiz and Pavon, Fl. Peruv. **2**: 7 (1799).—Apparently a rejected tentative name.

PERU: Known only from the original localities, Pongo and Atiquipa, prov. Camaná, dept. Arequipa, and from a more recent collection from "Lurigancho, 'Camino del Inca'."

MATERIAL EXAMINED: Peru, *Pavon* as *N. inflata* (FM, BD, Boiss, Deles); Peru, *Ruiz* as *N. inflata* (K, BD); Lurigancho, "Camino del Inca," *Martinet 288* (Paris).

When originally described this species was given as based upon a description and illustration supplied by Tafalla. There are, however, collections of this plant at Chicago, Kew, Berlin and Geneva which agree sufficiently well with the original description and plate to make me feel they are parts of the original collection. All this material is labeled *Nolana inflata* and as from the herbaria of Ruiz and Pavon. A close examination of the collections and a comparison of them with the original plate suggests a number of corrections. The root is strong and almost certainly persistent. It is prolonged upwards into the thickened base of the stem which is 2.5 cm. long and ca. 1 cm. thick and is densely beset with the persistent corky bases of old leaf- and stem-bases. The several ascending or decumbent stems are slender and ascendingly branched and are very much more leafy than illus-

trated. The leaves are not at all regularly opposite, in fact are only very rarely and sporadically so. The calyx is not as obviously ribbed nor so shallowly toothed as shown, and the pedicels are more slender. The corollas are ca. 2 cm., certainly not more than 3 cm. long when fresh.

The Martinet collections I have cited consist of two full sheets. They agree closely with the material from the herbaria of Ruiz and Pavon. If Tafalla's original material actually came from the department of Arequipa, in southern Peru, then I suspect that the geographical data associated with Martinet's collection must be questioned. The locality given by Martinet is Lurigancho. After a study of large-scale maps and of geographical gazeteers I am forced to place his locality in the valley of the Rimac several kilometers to the northeast of Lima. The localities given by Tafalla and Martinet are, accordingly, separated by over 500 km. and 3½ degrees of latitude. In addition they belong to different floristic areas. Considering the limited distribution of most Nolanaceae, and particularly the Peruvian ones, the range of *N. inflata* as determined by the localities of Tafalla and Martinet is so unusual as to be open to suspicion.

The receptacle of *Nolana inflata* is flattened and marked off by low radiating ridges into five sections each bearing a broadly and basally affixed rounded nutlet. Between the contiguous bases of these major nutlets and attached in tiny areolas at the outer end of the ridges on the receptacle are a series of 5–8 very small angular nutlets. These latter are wedged in between the bases of the major nutlets and are 1–2 mm. long and about 1 mm. high. In the original material some of the nutlets bear on their back several stout spreading subulate appendages, nearly 0.5 mm. long. In Martinet's material, however, the nutlets bear no such appendages, though they do tend to have similarly distributed scattered conic projections that are obviously homologous.

20. **Nolana humifusa** (Gouan), comb. nov.

Atropa humifusa Gouan, Hort. Reg. Monspel. 106 (March–June, 1762).—Described from garden material.

Zwingera humifusa (Gouan) Hofer, Acta Helv. **5**: 267, tab. 1 (1763–64).

Nolana prostrata Linnaeus, Sp. Pl. ed. 2, **1**: 202 (Sept. 1762), nomen; Linnaeus fil., Decas Pl. Rar Hort. Upsal. **1**: 3, t. 2 (July–Dec. 1762); Linnaeus, Sp. Pl. ed. 2, **2**: 1678 (1763); Linnaeus, Syst. ed. 12, **2**: 149 (1767); Miller, Gard. Dict. ed 8, (1768); Linnaeus, Mant. **2**: 334 (1771); Poiret in Lamark, Encyc. **4**: 497 (1796); Willdenow,

Sp. Pl. **1**: 794 (1798); Ruiz and Pavon, Fl. Peruv. **2**: 7 (1799); Dunal in DeCandolle, Prodr. **13**[1]: 9 (1852); Saunders, Jour. Genetics **29**: tab. 33 fig. 7–12 (1934).—Described from garden material.

Teganium procumbens Schmidel, Icon. Pl. 67, t. 18 (1766 ?).—Described from garden material.

Atropa gymnosperma Schmidel, Icon. Pl. 67 (1766 ?).—In Synonymy.

"*Nolana prostrata* (gallinacea)" Persoon, Synop. **1**: 168 (1805).

Nolana gallinacea Persoon ex Steudel, Nom. 556 (1821).

Neudorffia peruviana Adanson ex Steudel, Nom. 553 (1821).

Belladona peruviana Adanson ex Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852).

Nolana parviflora Philippi, Anal. Univ. Chile **91**: 35 (1895).—Type given as from coastal southern Peru.

PERU: Confined to the coastal hills of the department of Lima, extending from Chancay, lat. 11° 30′, south to Chorrillos, lat. 12° 15′ S.

SELECTED SPECIMENS: Lomas de Chancay, Sept. 1867, leaves fleshy, flowers pale violet with darker throat, *Raimondi 10910* (BD); Amancaes, 200–400 m. alt., open rocky hill, repent herb, corolla "pallid blue-violet" at the base intricately lined with "hyacinth-blue" and "blackish," June 1925, *Pennell 14808* (G); slope of Cerro San Cristobal, among rocks, Nov. 1895, *Brenning 155* (BD); rocky slope of San Augustin, fl. blue, leaves fleshy, Nov. 1901, *Weberbauer 1* (BD, Del); Cerro San Augustin, fl. blue, Sept. 1873, *Raimondi 12411* and *12461* (BD); vicinity of Lima, fl. blue, March 1876, *Raimondi 11990* (BD); San Lorenzo Island, July 1836, *Gaudichaud* (Paris); Callao, trailing on loose sandy clay sea-side plain, fleshy, fl. blue, Sept. 1923, *Macbride 5885* (G, FM, BD); Barranco, 50–200 m., dry sandy place at lower edge of Loma Formation, fl. blue, Oct. 1902, *Weberbauer 1603* (BD); hills near Barranco, 300 m. alt., Loma Formation in clay or rocky places, stems spreading, leaves fleshy, fl. pale blue with a violet-lined throat, Sept. 1910, *Weberbauer 5701* (G, FM, BD); Chorrillos, yerba ammaná de florecitas azules, July 1873, *Raimondi 12460* (BD); Chorrillos, patches, half-decumbent on loose stony slopes of seaside hills, ca. 150 m. alt., fl. blue with dark lines within near base, Sept. 1923, *Macbride 5858* (G, FM, K, Del.).

The burst of publication regarding *Nolana* in the years following 1761 necessitates a careful determining of priority among the various names proposed for the present species. Gouan's Hortus Monspeliensis evidently has priority. Within the book, on the page giving the approval of the Royal Society, there appears the printed date, March 11, 1762. The Journal des Sçavans, pg. 443, reviewed Gouan's book in Paris in the June issue for 1762. I have been unable to determine

the exact date of publication for the Decas of the Upsala Garden which was prepared by the younger Linnaeus. It bears on the title-page the date 1762. Fortunately the relative priority of the Decas and Gouan's book is adequately settled by a letter, dated July 4, 1762, addressed to Jacquin by the elder Linnaeus. In adjacent paragraphs it stated that Gouan's book has not been seen and that "Filius meus edit decurias rariorum plantarum in folio, cujus prima decuria sudat, et continet Nolanam, ..." Gouan's work was available in Paris in June and the Decas was still in preparation early in July of the same year. Through the kindness of Prof. Samuelsson inquiries regarding the dates of the Decas were made in Upsala. Dr. Arvid Hj. Uggla, secretary of the Swedish Linnaean Society replied, after a careful collation of the correspondence of Linnaeus and of the Decas with the books of the elder Linnaeus, that he suspects that the Decas was not published much before the notice in the issue of the Lärda tidningar (Stockholm) for Nov. 1st, 1762. There consequently seems good reason for accepting *Atropa humifusa* Gouan as the oldest name for the present well known Peruvian plant since it has at least one month and possibly as much as five months priority over *Nolana prostrata* L. The correct name for our plant is accordingly *Nolana humifusa* (Gouan), comb. nov.

The next possible competing name is *Zwingera* of Hofer. This was published on pg. 267 of the fifth volume of the Acta Helvetica which bears the title-page date, 1762. In the middle of the volume, on pg. 179, however, there is printed a letter bearing the date, Dec. 3, 1762! Finally in the Göttingische Anzeigen for Sept. 8, 1764, pg. 873, it is stated that the fifth volume of the Acta Helvetica "Mit vorgedrucktem Jahre 1762 aber eigentlich erst 1764 ist fertig worden." Hofer's name *Zwingera* is clearly one to two years later than the names proposed by Gouan and the younger Linnaeus.

Adanson's proposed generic name is readily eliminated also. Volume two of the Familles des Plantes bears the censor's date, Sept. 1, 1762. Otto Kuntze, Rev. Gen. 1: cxxiii (1891), has argued that the book must have, accordingly, been issued around the beginning of 1763. The only contemporary review I can find of Adanson's book is in the Parisian Mercure de France for Aug. 1763, pg. 111. The second volume of the Familles des Plantes appears to have just been issued. The review begins with the statement, "La première Parte n'a point paru; elle n'est pas entiérement imprimée." I doubt if the second volume of Adanson's work, which appeared first, could have been published before July 1763.

Though not the first species of the family known to European botanists, for *Tula* Adans. was collected by Feuillée in 1710 and described and figured by him in 1725, *Nolana humifusa* was the first of the Nolanaceae to reach European gardens and become a subject for repeated study. A rather attractive plant and, because of its fruit-structure, something of a botanical curiosity, it soon became represented in all the important botanical gardens. Under the name *Atropa humifusa* (*Atropa foliis geminatis, calycibus polycarpis caule humifuso*), Gouan gave the first published description of it before the middle of 1762, stating that the plant had been received at Montpellier as "*Atropa physalodes.*" Gouan did not know its source. In 1863–64 Hofer, of Mülhausen, provided a new description and a plate of the species and proposed the genus *Zwingera* to include *Atropa humifusa* of Gouan. In 1763 Kniphof, Bot. Orig. **10**: tab. 13 (1763), of Erfurt, also illustrated our plant under Gouan's name. Neither Hofer nor Kniphof indicate the source of their material, though we may suspect, since the plant was associated with Gouan's appelation only, that their seeds probably came from Montpellier. Schmidel, of Erlangen, in 1765–66, published a beautiful plate of our plant and a long discussion of it under the binomial *Teganium procumbens.* He cites Gouan's species as a doubtful synonym and states his material had been received as "*Atropa gymnosperma.*" His studies were made in 1762. The source of his original material is not indicated. Late in 1762 the plant was again figured and described by the younger Linnaeus. The genus and species, *Nolana prostrata,* were proposed by him upon the basis of plants grown at Upsala from seeds said to have come from Royen, of Leiden, under the phrase-name "*Belladona humifusa, flore violaceo, hispanicae.*"

In 1763 Adanson published *Neudorfia,* yet another generic name for the present plant. His material came from the Paris Garden where it was called "*Belladona Peruviana, repens, flora caerulea.*" About the same time in England, in a paper read May 1763, though not published until the following year, Ehret illustrated and described the same species under the mononomial *Walkeria* Mill., stating that it had flowered in Chelsea in 1761. He adds that "The ingenious and learned Dr. Albert Schlosser, of Amsterdam F. R. S., presented me with many curious dried specimens of plants, which he had collected in the Botanic Garden at Paris in the year 1755; amongst which was this plant, under the name of Belladona Peruviana minor. Jussieu. Hort. Reg. Paris."

The earliest record of the plant in Europe, that is to say at Paris in

1755, associates the plant with the name of Jussieu and correctly attributes it to Peru. These facts suggest the ultimate source of the garden material which became widely distributed and was described and figured in various parts of Europe in a burst of publication in 1762–63. During the middle third of the eighteenth century Bernard de Jussieu, then in charge of the Paris gardens, received many seeds from his brother Joseph, then resident in western South America. It is well known that many plants were raised at Paris from Bolivian, Ecuadorian and Peruvian seeds received from Joseph de Jussieu. The familiar garden Heliotrope is perhaps the most famous and successful result of his seed collecting. It seems not at all improbable, therefore, that the *Nolana* also appeared at Paris through his efforts and from that center, about 1760 was eventually sent to other European gardens.

Gouan, Hofer, Kniphof and Schmidel, among the authors before 1800, offered no suggestions as to the native home of *Nolana*. The younger Linnaeus, citing Royen's polynomial which attributed the plant to Spain, remarked that "Patria hujus omnino me fugit, nisi sit. Hispania." It is very interesting to note, however, that a year earlier, the elder Linnaeus in a letter (dated Aug. 25, 1761) to Boissier de Sauvages, the friend and predecessor of Gouan at Montpellier, questions the source of the plant as follows, "Annon vidisti *Belladonnam* (*atropam*) *humifusam*, Hispanicam? Non credo quod sit originis Hispanicae; an Peruviana?" Adanson at Paris attributes the species to Peru. Ehret in London entitled his paper "A New Peruvian Plant" and cites a garden-name from Paris indicating the same origin. Nevertheless five years later, in 1768, Miller in his Dictionary gives the plant as from Egypt and states he had received seeds of it from Forskål. In the second Mantissa, in 1771, Linnaeus gives Peru as the unquestioned source of the *Nolana*, and in 1799 the matter was finally settled definitely by Ruiz and Pavon who described plants they had personally collected near Lima, Peru. It is most fortunate that our plant possesses a prominent and distinctive character in the plicate sinus of the calyx. This development permits the exact identification of garden material illustrated before 1800 and clearly associates this material with the common plant of the seaward slopes in the vicinity of Lima. The original seeds of *Nolana* came from within a hundred kilometers of Lima and probably from the hills in its immediate environs. They were collected, I believe, by Joseph de Jussieu.

21. **Nolana coronata** R. & P.

Nolana coronata Ruiz and Pavon, Fl. Peruv. **2**: 6, tab. 112b (1799); Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852).—Original material from near Pongo and Atiquipa, collected by Tafalla.

PERU: Coast of the department of Arequipa.

SPECIMENS EXAMINED: Peru, *Pavon* as *N. coronata* (Boiss, Deles); Peru, *Ruiz* as *N. coronata* (K, BD); Atiquipa, lat. 15° 50′ S., flower clear blue-violet with dark center, Oct. 1863, *Raimondi 10857* (BD).

There is apparently authentic material of this species, from the herbaria of Ruiz and Pavon, at Chicago, Kew, Berlin and Geneva. Although a poor specimen, Raimondi's collection is evidently conspecific. A study of the old material shows that the underground parts of *N. coronata* is a short-lived tap-root and that the base of the plant may become somewhat woody and persistent. The stems are ascending and glabrous. The specimens do not have the hairy stems illustrated and the calyx is not so patently ribbed. I know the fruiting parts of this species only from the plate accompanying the original description. The species seems to be the closest relative of *N. humifusa*.

22. **Nolana plicata** Johnston

Nolana plicata Johnston, Contr. Gray Herb. **85**: 174 (1929).—Type from near Atiquipa, *Weberbauer 7190*.

PERU: Known only from the type collection.

SPECIMEN EXAMINED: Atiquipa, dept. Arequipa, lat. 15° 50′ S., in the Loma Formation, 270 m. alt., spreading and suffrutescent, corolla bluish pink with the throat violet, Nov. 28, 1915, *Weberbauer 7190* (FM, TYPE; BD).

The calyx is conspicuously plicate having prominent folds through each sinus. The calyx-lobes are sharply triangular and not half the total length of the calyx. The latter is lance-ovate in outline being broadest just above the rounded base and then gradually contracted towards the apex formed by the connivent lobes. The species is probably most closely related to *N. coronata* which is a glabrate plant with broader leaf-blades more abruptly contracted into the petiole.

23. **Nolana Guentheri** sp. nov.

Herba laxe decumbens; radice ignota; caulibus pluribus 2–5 dm. longis sparse ramosis 3–5 mm. crassis fistulosis dense glanduliferis plus minusve villosis mox glabrescentibus, 2–12 cm. longis, ascendentibus, internodiis 3–7 cm. longis; foliis compressis; lamina elliptica vel obovata, 15–25 mm. lata, 2–3 cm. longa, infra medium basim

versus in petiolum 1–1.5 cm. longum et 1.5–2 mm. latum plus minusve villosum attenuata evidenter medio-costata inconspicue sparseque nervata apice rotundata margine plus minusve villosa ceterum subglabra; calyce ad anthesin 10–13 mm. longo stipitato-glanduloso villoso, tubo 3–4 mm. profundo ca. 5 mm. crasso, lobis erectis cuneato-lanceolatis 1.5–2 mm. latis apice acutis; pedicellis 1–5 mm. longis; calycibus fructiferis subhyalinis fructu disruptis, lobis incurvatis, pedicellis 5–25 mm. longis recurvatis; corolla coerulea infundibuliformi 2.5–3 cm. longa et lata, lobis ascendentibus ovatis apice rotundis; nuculis 5 equalibus angulatis uniseriatis ca. 4 mm. longis, dorse convexis, margine angulatis, ventre cicatrix ca. 3 mm. diametro convexis ornatis; receptaculo ca. 6 mm. diametro 3 mm. alto in fossas 5 conspicuas concavas profunde excavato.

PERU: Cachendo east of Mollendo, dept. Arequipa, 1000 m. alt., Oct. 15, 1923, *Guenther and Buchtien 113* (TYPE, Hamburg).

A well marked species resembling *N. humifusa* in gross habit but different in being slightly coarser throughout with evidently hairy herbage and a very different calyx. The type was placed under *N. prostrata* by Bruns, Mitt. Inst. Bot. Hamburg **8**: 72 (1929).

24. **Nolana polymorpha** Gaud.

Nolana polymorpha Gaudichaud, Bot. Voyage Bonite, Atlas tab. 101 (1851–52).

I know this species only from Gaudichaud's plate. No material possibly referable to this remarkable plant has been seen in any of the herbaria visited. Possibly the type may be preserved in the Webb collections at Florence. It may have been collected at Cobija, Chile. The stems are shown as quite shrubby and as bearing numerous tight buds on the old wood. The nutlets are shown as 5 in number, broadly ellipsoid and strongly keeled. Their attachment is small and obliquely basal. The corolla is large with a broad open throat. The calyx is deeply bifid on two sides, with the divergent lobes weakly 2–3 dentate at their apices. It is, hence, distinctly bilabiate. The root is shown as very long, strong and woody. I can suggest no close relative for the plant as illustrated by Gaudichaud.

25. **Nolana thinophila** sp. nov.

Planta gracilis procumbens laxe ramosa 2–5 mm. diametro succulenta inconspicue glandulosa plus minusve glutinosa glaberrima; caulibus suffruticosis 1.5–3 mm. crassis internodiis 1–5 cm. longis; foliis compressis spathulatis 1–3 cm. longis 1.5–3 mm. latis medium versus latioribus basim versus gradatim attenuatis apice rotundis vel obtusis; pedicellis gracilibus 6–15 mm. longis ascendentibus, fructiferis

recurvatis; corolla coerulea 15–20 mm. longa ca. 10 mm. diametro, lobis ovatis ascendentibus, tubo ca. 8 mm. longo 1–1.5 mm. crasso quam calyce evidenter longiore intus sparse villosulo; filamentis linearibus 4–5 mm. longis inaequalibus; calycibus 6–7 mm. longis bifidis haud dentatis, tubo cylindrico 2–3 mm. crasso maturitate nuculis distento demum disrupto 4–5 mm. crasso; nuculis nigris plus minusve inaequalibus saepe 5 elongatis 3–5 mm. longis 2–2.5 mm. crassis dorso rotundis ventre areola elliptica ca. 3 mm. longa ornatis; receptaculo 10–15-dentato gynobasi humili ca. 2 mm. lata ca. 0.5 mm. alta ornato.

PERU: Sea-shore in the vicinity of Mollendo, dept. Arequipa, lat. 17° S.

SPECIMENS EXAMINED: Sandy sea-beach, Mollendo, succulent herb forming loose mats 2–5 m. broad, corolla "pleroma-violet," May 31, 1925, *Pennell 14280* (TYPE, Gray Herb.); seashore at Mollendo, *D. Safford K55* (K); abundant on seashore at Mejia, flowers blue, July 22, 1923, *Guenther and Buchtien 121* (Hamb).

A very distinct species notable in particular for its cleft but quite unlobed or untoothed calyx, its glabrous but glandular glutinous herbage, and its 5 elongate erect nutlets. The black nutlets are rounded on the back. The face is occupied by a large scar. They are seated on a very low and broad gynobase and are joined to one another ventrally. The collection from Mejia has been reported as *Dolia rupicola* by Bruns, Mitt. Inst. Bot. Hamburg. **8**: 71 (1929).

26. **Nolana aplocaryoides** (Gaud.), comb. nov.

Leloutrea aplocaryoides Gaudichaud, Bot. Voyage Bonite, Atlas tab. 110 (1851–52).—Type collected at Cobija by Gaudichaud.

Bargemontia aplocaryoides (Gaud.) Johnston, Contr. Gray Herb. **85**: 110 and 157 (1929).

Alona pusilla Philippi, Fl. Atac. 45 (1860) and Viage Des. Atac. 10, 16, 219 (1860); Reiche, Anal. Univ. Chile **125**: 499 (1910) and Fl. Chile **5**: 427 (1910).—Original material collected by Philippi at Caldera and near Cachinal de la Costa.

CHILE: Coastal plain of the provinces of Antofagasta and Atacama, from Cobija south to Caldera, lat. 22° 30′ to lat. 27° 15′ S.

SPECIMENS EXAMINED: Caldera, Oct. 1924, *Werdermann 1655* (G, BD); hills back of Barquito, erect clammy succulent herb on gravelly alluvial fan, corolla lavender, Oct. 1925, *Johnston 4814* (G); Taltal, herb, fleshy, very glandular and viscid, corolla pale bluish, 100 m. alt., Oct. 1925, *Werdermann 774* (G, BD); Punta Buitre, erect annual in sand, flowers lavender, Dec. 1933, *Johnston 5243* (G); Antofagasta, dry gravelly plain, plant erect, clammy, corolla dilute bluish, Oct. 1925, *Johnston 3639* (G); Cobija, *Gaudichaud 1* (Paris).

A very well marked species notable in particular for its excessively clammy slimy indument and for the reduction in number of nutlets. A study of the immature fruit shows that five rudimentary nutlets are present. Of this number two or rarely even more are regularly aborted.

27. **Nolana Pearcei** sp. nov.

Herba annua erecta 2–3 dm. alta supra medium sparse ascendenter ramosa, partibus junioribus sparse inconspicueque glandulosis et sparse villosis; ramulis ultra medium conspicue foliatis et breviter ramulosis; foliis apicem versus ramorum congestis, laminis compressis ellipticis vel anguste lanceolatis 1–2 cm. longis 3–6 mm. latis infra medium in petiolum gracilem 6–10 mm. longum gradatim vel abrupte attenuatis margine vix revolutis apice acutis; pedicellis ca. 1 mm. longis; calycibus ad anthesin 6–8 mm. longis, tubo cupulari 2–3 mm. diametro 1.5–2.5 mm. profundo, lobis angustis valde inaequalibus linearibus vel cuneatis; calycibus fructiferis ignotis; corolla coerulea infundibuliformi 2–2.5 cm. longa extus sparse puberula, tubo lobis calycis subaequali intus breviter piloso ca. 1.3 mm. crasso, lobis rotundis ascendentibus, limbo 10–15 mm. diametro; staminibus linearibus inaequalibus 6 et 8 mm. longis glabris; fructibus ignotis.

PERU: Tacna, erect tree-like annual, flowers blue, Sept. 1864, *Pearce* (TYPE, Kew; isotype Brit. Mus.).

The type consists of only the upper part of the plant and is in the flowering condition only. The material at the British Museum shows the root, but is a poorer specimen. The species is obviously a very distinct one, probably having its closest relations in *N. aplocaryoides*.

28. **Nolana Weberbaueri** sp. nov.

Herba annua erecta 1–2 dm. alta pilis numerosis inconspicuis erectis plerumque glanduliferis vestita; caulibus fistulosis 2–3 mm. crassis pallidis infra medium plus minusve simplicibus supra laxe dichotomeque ramosis, internodiis 1–3 cm. longis; foliis aliquantum succulentis pallidis, lamina ovata vel deltoideo-ovata 7–15 mm. longa 4–10 mm. lata apice obtusa basi rotunda vel obtusa in petiolum gracilem 5–20 cm. longum abrupte contracta evidenter costata; pedicellis ad anthesin gracillimis erectis ca. 4 mm. longis, fructiferis duplo vel triplo longioribus imam ad basim abrupte deflexis; calycibus ad anthesin 4–5 mm. longis profunde lobatis, tubo ca. 2 mm. diametro cupulato ad 1 mm. profundo, lobis inaequalibus linearibus vel cuneatis; corolla rubro-violacea infundibuliformi 15–18 mm. longa extus minute sparseque puberulenta, tubo 2–3 mm. longo intus minute villuloso ca. 1 mm. crasso quam calyce breviore, limbo ca. 12 mm. diametro, lobis rotundis brevibus ascendentibus; filamentis inaequalibus lineari-

bus glabris 4–5 mm. longis; nuculis 4–6, conspicue tuberculato-rugosis irregulariter depresseque globosis 2–3 mm. diametro nigris.

PERU: Western Andean slopes east of the port of Pisco, between Huauyanga and Pampano, district Huancáno, dept. Ica, 1000–1200 m. alt., steep rocky places, annual herb with somewhat fleshy leaves, flowers "rot-lila," May 1910, *Weberbauer 5385* (TYPE, Gray Herb.; FM, BD).

The affinities of this plant are obviously with *N. laxa*, another species of the western cordilleran slopes of central Peru. The present species comes from about lat. 13° 45′ S. and nearly 100 km. inland. Its only known locality is southeasterly from Lima. That of its relative, *N. laxa*, is roughly northeasterly from the Capital. They are distinctly plants of the interior.

29. **Nolana laxa** (Miers), comb. nov.

Dolia laxa Miers, Hooker London Jour. Bot. **4**: 504 (1845) and Ill. So. Am. Pl. **1**: 57 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 16 (1852). —Type given as from Canta.

PERU: known only from Canta, dept. Lima, lat. 11° 25′ S.

MATERIAL EXAMINED: Canta, *ex herb Ruiz and Pavon, Lima* (Kew, TYPE).

The type and only known collection of this plant consists of three small branches. There is fruit but no vestiges of the corolla. The very slender habit of the plant, the kind of pubescence and glandularity, the leaf-texture, the shape of the calyx, the size and direction of the pedicels, the distinctly roughened nutlets, etc., all indicate a very close affinity with *N. Weberbaueri*. All this makes me believe that future collections will prove that *N. laxa* is also a slender erect annual herb. So evident is the relation between these two species that I should not be surprised if intergrades are discovered. The present species comes from the cordilleran slopes about 70 km. inland. At Canta it sets the northern limit of the family on the continent. The altitude of that town is given on maps as 2942 meters.

30. **Nolana gracillima** (Johnston), comb. nov.

Bargemontia gracillima Johnston, Contr. Gray Herb. **85**: 176 (1929).—Type from hills near Moquegua, *Weberbauer 7457*.

PERU: Departments of Moquegua and Tacna. CHILE: Province of Arica. A species of the interior; growing above 1500 m. alt., 20–60 km. from the coast at the base of the cordilleras east of the coastal deserts; lat. 17° 12′ south to lat. 19° S.

SPECIMENS EXAMINED: Hills southeast of Moquegua, dept. Moque-

gua, lat. 17° 12′ S., long. 70° 50′ W., with other desert annuals, alt. 1500–1600 m., flowers violet, leaves fleshy, March 1925, *Weberbauer 7457* (FM, TYPE; G, K, Deles); Tacna, dept. Tacna, in sandy places, erect annual 15–30 mm. tall, flowers blue, Sept. 1864, *Pearce* (K); Putaralla, valley of the Rio Camarones, dept. Arica, lat. 18° 58′ S, long. 69° 40′ W., 2000 m. alt., April 14, 1927, *Troll 3300* (BD).

The type of *N. gracillima* was collected in the same region as that of *N. platyphylla*. Among the specimens on the isotypic sheet of this species at the Gray Herbarium there is one plant that combines, curiously, a number of the quite diverse traits of *N. gracillima* and *N. platyphylla*. This plant is, I believe, a hybrid. The fruit of *N. gracillima* consists of 5 subequal globose nutlets that are affixed to a flattened receptacle. The plant is distinctly annual and quite herbaceous.

31. **Nolana platyphylla** (Johnston), comb. nov.

Bargemontia platyphylla Johnston, Contr. Gray Herb. **85**: 175 (1929).—Type from near Moquegua, *Weberbauer 7455*.

PERU: Known only from the type locality; about 50 km. from the coast east of the coastal desert at the base of the cordilleras in the department of Moquegua.

SPECIMEN EXAMINED: Hills southeast of Moquegua, lat. 17° 12′ S., long. 70° 50′ W., 1500–1600 m. alt., with other desert annuals, flowers sky-blue, leaves fleshy, March 1925, *Weberbauer 7455* (FM, TYPE; G, K, DB, Deles).

Related to *N. gracillima* but except for an evident hybrid plant, abundantly distinct from that species. It is coarser throughout and is much less freely branched in habit. The pedicels are stouter and the calyx is larger and coarser than in any of the Peruvian annuals of this immediate relationship. The 5–10 nutlets are erect, obovoid and basally affixed. They are uniseriate and subequal and are affixed to a low convex gynobase. The receptacle is about 10-toothed.

32. **Nolana flaccida** (Phil.), comb. nov.

Alona ? flaccida Philippi, Anal. Univ. Chile **91**: 39 (1895); Reiche, Anal. Univ. Chile **125**: 501 (1910) and Fl. Chile **5**: 429 (1910).—Type collected in Valle del Salado by San Roman.

Bargemontia flaccida (Phil.) Johnston, Contr. Gray Herb. 85: 109 (1929).

Alona patula Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 3 (1891), nomen; Philippi, Anal. Univ. Chile **91**: 39 (1895).—Type-specimens collected by San Roman in Valle de Juncal and in Quebrada de Chaco.

CHILE: Gravelly stream-ways in northernmost Atacama (Valle de Salado, Caleta de Pan de Azucar, Carrizalillo and Juncal), lat. 26° 25′ to 25° 50′ S.; also reported by Philippi from El Chaco, lat. 25° 27′ S., in southernmost Antofagasta. The plant occurs from the coast to over a 125 km. inland and from sea-level to 2000–3000 meters in altitude.

This species along with *N. mollis* forms a small natural group quickly separable from the other shrubby species by having a coarse, cylindrical, short-toothed calyx and comparatively large corollas. The two species tend to develop more nutlets (5–10) than is common among the shrubby members of the genus. *Nolana flaccida* is a loosely and very widely branched, prostrate, pale green, practically glabrous shrub 1.5–3 dm. high and 10–20 dm. broad.

33. **Nolana mollis** (Phil.), comb. nov.

Alona mollis Philippi, Fl. Atac. 44 and Viage Des. Atac. 16, 24, 38, 218 (1860); Reiche, Anal. Univ. Chile **125**: 499 (1910) and Fl. Chile **5**: 427 (1910).—Type collected at Cachinal de la Costa by Philippi.

Bargemontia mollis (Phil.) Johnston, Contr. Gray Herb. **85**: 109 (1929).

Dolia macrocalyx Philippi, Anal. Univ. Chile **91**: 45 (1895); Reiche, Anal. Univ. Chile **125**: 502 (1910) and Fl. Chile **5**: 430 (1910).—Type collected near Taltal by Borchers.

CHILE: Gravelly slopes and stream-ways near coast, from Chañaral to Taltal, lat. 26° 30′ north to 25° 15′ S., in adjacent portions of the provinces of Atacama and Antofagasta.

A globose or decumbent shrub with its rather succulent herbage covered with a slimy indument of long simple hairs. Known only from within a few kilometers of the coast, the species has been collected near Barquito, Caleta de Pan de Azucar, Cachinal de la Costa, Aguada de Cachina, and Taltal. Material from the port of Antofagasta reported by Herzog as *D. macrocalyx* proves to represent *Nolana peruviana*, cf. Johnston, Revista Chilena **34**: 232 (1930).

34. **Nolana tarapacana** (Phil.), comb. nov.

Dolia tarapacana Philippi, Cat. Pl. Itin. Tarapaca 68 (1891); Reiche, Anal. Univ. Chile **125**: 505 (1910) and Fl. Chile **5**: 433 (1910).—Type from the Médanos de Pica.

Bargemontia tarapacana (Phil.) Johnston, Contr. Gray Herb. **85**: 110 (1929).

CHILE: Known only from the sands near Pica, prov. Tarapacá, at the base of the cordillera about 100 km. inland, lat. 20° 30′ S. and long. 69° 20′ W.

SPECIMEN EXAMINED: Quebrada de Quisma near Pica, 1400 m. alt., flowers small, deep blue, Sept. 1925, *Werdermann 741* (G, BD).

I have judged this species upon the basis of the collection above cited. The plant seems particularly notable by having its small tubular corollas only shortly surpassing the slender elongate calyx-lobes, and in having the calyx-tube well developed, tightly and completely investing the fruit, and finally irregularly disrupted by it at maturity. The receptacle is very unequally and deeply 3–8-lobed and bears a thin erect transverse plate bearing the style. The 3–7 nutlets are attached to the receptacle near their basal end. Were the receptacle explanate the elongate suprabasally attached nutlets would be spreading. Perhaps because of the crowding of the growing structures within the tight calyx-tube, the receptacle is distorted with the margins and lobes irregularly upturned and the nutlets are forced into an erect position. The nutlets are very unequal and through crowding somewhat angulate.

35. **Nolana linearifolia** Phil.

Nolana linearifolia Philippi, Anal. Univ. Chile **91**: 28 (1895); Reiche, Anal. Univ. Chile **125**: 484 (1910) and Fl. Chile **5**: 412 (1910).—Type collected in the Sierra Esmeralda by San Roman.

Bargemontia linearifolia (Phil.) Johnston, Contr. Gray Herb. **85**: 109 and 156 (1929).

Nolana decemloba Herzog, Mededeel. Rijks Herb. **29**: 20 (1916).—Type from the coastal hills near Antofagasta, *Herzog 2319*.

CHILE: Growing in very arid gravelly places in the province of Antofagasta. Known from three localities; inland in the Sierra Esmeralda (lat. 25° 50′ S.), crest of the coastal hills above the fog belt at Aguada Panulcito (lat. 24° 50′ S.), and in the dry quebradas in the coastal hills about Antofagasta (lat. 23° 40′ S.).

The delicate, bright blue, tubular corollas of this species have the lobes so strongly and deeply notched as to appear 10-lobed. In habit the plant is trailing. Some plants flower very quickly and appear to be herbaceous annuals. There is good indication, however, that normally these plants persist for several years. The fruit consists of 3–6 spherical or ovoid, black nutlets, ca. 2 mm. in diameter. These are basally affixed to a cartilaginous receptacle. Hence, though the species is aberrant in corolla, the fruit agrees closely with that prevailing among the shrubby members of its genus.

36. **Nolana salsoloides** (Lindl.), comb. nov.

Dolia salsoloides Lindley, Bot. Reg. **30**: sub tab. 46 (1844); Miers, Hooker London Jour. Bot. **4**: 503 (1845) and Ill. So. Am. Pl. **1**: 56

(1850); Gay, Fl. Chile **5**: 109 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 15 (1852).—Type collected by Macrae in "Chile," probably north of Coquimbo.

Bargemontia salsoloides (Lindl.) Johnston, Contr. Gray Herb. **85**: 111 (1929), as to name only.

? Alona micrantha Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 16, 218 (1860).—Type collected by Philippi near Cachinal de la Costa.

? Dolia micrantha (Phil.) Reiche, Anal. Univ. Chile **125**: 503 (1910) and Fl. Chile **5**: 431 (1910).

? Bargemontia micrantha (Phil.) Johnston, Contr. Gray Herb. **85**: 108 (1929).

Alona xerophila Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 17, 218 (1860); Reiche, Anal. Univ. Chile **125**: 500 (1910) and Fl. Chile **5**: 428 (1910).—Type collected by Philippi near Cachiyuyal, ca. 600 m. alt., lat. 25° 46′ S.

Alona rigida Philippi, Anal. Univ. Chile **91**: 38 (1895).—Type collected by San Roman in the Sierra Esmeralda.

Osteocarpus spathulatus Philippi, Anal. Univ. Chile **91**: 41 (1895).—Type collected by Geisse on the Morro de Caldera.

Dolia puberula Philippi, Anal. Univ. Chile **91**: 43 (1895).—Type-material from Copiapó and Chañarcillo.

Dolia clavata var. *puberula* (Phil.) Reiche, Anal. Univ. Chile **125**: 506 (1910) and Fl. Chile **5**: 434 (1910).

? Dolia hirsutula Philippi, Anal. Univ. Chile **91**: 46 (1895).—Type collected by Larrañaga at Breas.

CHILE: Ranging from the Taltal Valley, in the prov. Antofagasta, southward into the northwestern parts of the prov. Coquimbo; growing along the coast and in the dry interior; lat. 25° 20′ south towards lat. 30° S. Reported as far south as "Coquimbo."

As here taken *N. salsoloides* is a variable species and one which future collecting and further study may prove to consist of several varieties or close species worthy of recognition. It is closely related to *N. divaricata* (= *Dolia clavata* Miers!), differing in having hairy younger foliage and branchlets, and narrower and more elongate leaves. The plant is a shrub, 5–10 dm. tall and has blue corollas.

The type of *N. salsoloides* was collected by Macrae during the ten days that the *Blonde* lay at anchor in Coquimbo Bay early in December 1825. The type is not representative of the common form of the species as here defined. I have seen no other material like it from the province of Coquimbo. A party from the *Blonde*, however, did visit Arqueros, a mining district northeast of Coquimbo. It seems most probable, therefore, that the type of *N. salsoloides* may have come from that locality, especially since many plants of Arqueros do have their closest affinities in western Atacama, the very region in

which some forms suggesting the type of *N. salsoloides* have been found. Since the *Blonde* put in at none of the ports between Coquimbo and Callao it is obvious that the application of the name *N. salsoloides* by Gaudichaud, Philippi, Reiche and Johnston, to an endemic plant of the arid northern coast of Chile must be erroneous. This northern plant, in fact, is very distinct from *N. salsoloides* and is described in this paper as *N. ramosissima*. Macrae's collection of *N. salsoloides* is represented by the type in the Lindley collections at Cambridge University, and by an isotypic duplicate in the Bentham collections at Kew. A study of these collections shows that the young branchlets bear numerous short spreading more or less glandular hairs. The slender, spathulate leaves bear scattered glandular hairs but tend to become quite glabrous in age. The original collections have no curly hairs and do not have the axillary flocculae that are so characteristic of most plants I am treating with them. They are, however, remarkably like material from Copiapó that has been determined as *D. puberula* by Philippi. The ultimate disposition of this rare typical form of *N. salsoloides* must await further collecting and study.

One of the common forms of this broadly drawn species is that represented by material from about Caldera. This has the stems, and frequently the leaves, bearing slender somewhat curling hairs. The type of *O. spathulatus* is an extreme form of it.

North of Caldera the plants tend to have the pubescence not spreading, but rather more or less appressed and interlaced and hence somewhat arachnose-wooly. *Alona xerophila* and *A. rigida* have this type of indument. The types of these two species, coming from the markedly desert interior, are more stiff and woody, but otherwise are much like plants from the more favorable situations nearer the coast (e. g. *Werdermann 834* from near Taltal). I have seen no authentic material of *D. micrantha* and *D. hirsutula*.

37. **Nolana divaricata** (Lindl.), comb. nov.

Aplocarya divaricata Lindley, Bot. Reg. **30**: sub. tab. 46 (1844); Gay, Fl. Chile **5**: 107 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 18 (1852); Philippi, Anal. Univ. Chile **18**: 57 (1861); Philippi, Linnaea **33**: 208 (1864).—Type from Coquimbo, *Cuming 862*.

Dolia divaricata (Lindl.) Hooker and Arnott ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b**: 4 (1891); Reiche, Anal. Univ. Chile **125**: 506 (1910) and Fl. Chile **5**: 434 (1910).

Bargemontia divaricata (Lindl.) Johnston, Contr. Gray Herb. **85**: 108 (1929).

Dolia clavata Miers, Hooker London Jour. Bot. **4**: 503 (1845) and

Ill. So. Am. Pl. **1**: 56 (1850); Gay, Fl. Chile **5**: 109 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 15 (1852); Reiche, Anal. Univ. Chile **125**: 506 (1910) and Fl. Chile **5**: 434 (1910).—Type: *Bridges 1324*, originally given as from "Concepcion," but actually from near the coast at Coquimbo.

Bargemontia clavata (Miers) Johnston, Contr. Gray Herb. **85**: 106 (1929).

? Alona sphaerophylla Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 12, 218 (1860); Reiche, Anal. Univ. Chile **125**: 499 (1910) and Fl. Chile **5**: 427 (1910).—Type collected by Philippi in Valle de las Animas, east of Chañaral.

? Bargemontia sphaerophylla (Phil.) Johnston, Contr. Gray Herb. **85**: 107 (1929).

Osteocarpus clavatus Philippi, Anal. Univ. Chile **91**: 41 (1895).—Type collected on the Morro de Caldera by Geisse.

CHILE: Near the coast from southwestern parts of the prov. of Antofagasta (Aguada de Cachina), southward to Ovalle in the province of Coquimbo, lat. 26° south to lat. 31° S.

In its common extreme form this species is characterized by its broadly spathulate or clavate, quite glabrous leaves. These are gradually expanded and cuneate to well above the middle, where they are abruptly enlarged into a globose or ovoid, thick, blade-like upper third. The plant forms a dense succulent globose bush 1–2.5 m. tall and seems to be confined to the hills near the sea.

The type of *N. divaricata* is said to have come from Coquimbo, but as with others of Cuming's collections so labeled, it may have been obtained at some of the small Chilean ports further north. The type, unfortunately, is not the common form of the species. The leaves are not so broadly and abruptly expanded as usual, and the youngest branchlets and leaves bear some scattered short inconspicuous hairs. It is, in fact, more or less transitional between the common forms of what I am calling *N. divaricata* and those I have treated under the name *N. salsoloides*. In the past the name *D. divaricata* has been associated with the latter concept. The type, however, has more of the characters of the plants I am now associating with it.

The type of *Dolia clavata* is the common and characteristic form of the present species. Although originally given as from Concepcion it came, in fact, from the coast near Coquimbo. The collector noted it to be a shrub 3–9 dm. tall and as having blue flowers. The data on the type-locality previously given by me, Contr. Gray Herb. **85**: 107 (1929), is quite incorrect! *Osteocarpus clavatus*, from the headlands near Caldera, seems to be quite similar to *D. clavata*. *Alona sphaerophylla* must be an extreme xerophytic form with crowded reduced leaves.

38. **Nolana glauca** (Johnston), comb. nov.

Bargemontia glauca Johnston, Contr. Gray Herb. **85:** 105 (1929).—Type collected in the hills back of Barquito, *Johnston 4770.*

CHILE: Known only from the type-material collected in the coastal hills of northwestern Atacama, lat. 26° 22′ S.

A sprawling quite glabrous shrub with distinctly glaucous herbage and white corollas. A very distinct species with closest relations, probably, in *N. divaricata* or *N. peruviana.*

39. **Nolana peruviana** (Gaud.), comb. nov.

Bargemontia peruviana Gaudichaud, Bot. Voyage Bonite, Atlas tab. 8 (1841); Walpers, Repert. **6:** 551 (1847); Dunal in DeCandolle, Prodr. **13**[1]**:** 18 (1852); Johnston, Contr. Gray Herb. **85:** 159 (1929) and Revista Chilena **34:** 232 (1930).—Type collected at Cobija by Gaudichaud.

CHILE: Known only from the coastal hills of the province of Antofagasta (Tocopilla, Cobija and Antofagasta), lat. 22° to 23° 40′ S.

SPECIMENS EXAMINED: Coastal hills near Tocopilla, Aug. 1925, *Berninger 440* (BD); Tocopilla, 1930, *Jaffuel 1043* (G); Cobija, *Gaudichaud* (BD, Deles); rocks about Cobija, half-prostrate bush, 3–6 dm. tall, corolla yellowish, Aug. 1864, *Pearce* (K); Antofagasta, 1914, *Rose 19420* (NY, US); Antofagasta, 1930, *Jaffuel 1118* (G); open rocky canyon, Antofagasta, forming wide clumps, 1925, *Pennell 13017* (G, NY, K); small shrub on rocky desert near Antofagasta, flowers pale yellowish, *Herzog 2455* (BD, Leiden).

Suggesting the common forms of *N. divaricata* in the shape of leaf, but evidently more related to *N. crassulifolia* and its allies. The species is very well marked and has been admirably illustrated by Gaudichaud. Herzog, Meded. Rijks Herb. **29:** 22 (1916), has reported his collection under the incorrect name, "*Dolia macrocarpa.*"

40. **Nolana albescens** (Phil.), comb. nov.

Dolia albescens [Philippi] Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b:** 4 (1891), nomen; Philippi, Anal. Univ. Chile **91:** 44 (1895); Reiche, Anal. Univ. Chile **125:** 504 (1910) and Fl. Chile **5:** 432 (1910).—Type collected at Monte Amargo.

Bargemontia albescens (Phil.) Johnston, Contr. Gray Herb. **85:** 108 (1929).

Dolia canescens Philippi, Anal. Univ. Chile **91:** 46 (1895).—Type collected at Galena by Geisse.

CHILE: Dry hills about the Copiapó Valley and just southward to the vicinity of Chañarcillo, prov. Atacama, lat. 27° 20′ south to 27° 50′ S.

Closely related to *N. incana* of the coastal area north and south of Taltal, but apparently a more bushy and erect plants and evidently more of an interior than a coastal species. The ranges of *N. albescens* and *N. incana* are separated by a geographical hiatus of over a hundred kilometers. *Nolana albescens* is usually a bush about a meter high and has white corollas. As I have previously remarked, l. c., it gives some evidence of being a myrmecophyte.

41. **Nolana Werdermannii** sp. nov.

Frutex 1–1.5 m. altus griseus dense minuteque stellato-tomentosus inconspicue glandulosus; ramis gracilibus erectis vel ascendentibus teretibus in partibus vetustioribus plus minusve glabrescentibus; internodiis 5–10 cm. longis quam foliis brevioribus; foliis alternis numerosis lineari-spathulatis vel linearibus carnosulis plus minusve compressis ascendentibus 1.5–2.5 cm. longis 1–2.5 mm. latis apicem versus latioribus deinde basim versus gradatim attenuatis, apice obtusis, margine anguste inconspicueque revolutis; floribus in axillis foliorum superiorum solitariis; pedicellis gracilibus 3–6 mm. longis ascendentibus quam foliis brevioribus, fructiferis reflexis paullo robustioribus; calyce ad anthesin 6–7 mm. longo, tubo cupulato 2–2.5 mm. longo et crasso, lobis 5 erectis cuneatis inaequalibus 4–5 mm. longis imam ad basim 0.8–1 mm. latis apice acutis fauces vel sinus corollae attingentibus; tubo calycis fructiferi subexplanato, lobis erectis vel supra nuculas subfornicatis; corolla 7–8 mm. longa alba extus puberulente, tubo 5–6 mm. longo quam calyce breviore cylindrico intus basim versus dense pubescente, faucibus vix differentiatis, lobis ascendentibus ovatis 1.5 mm. latis ad 2 mm. longis apice rotundis; staminibus inaequalibus 2.5–3.5 mm. longis, 1 mm. supra basim incrassatis et dense pubescentibus; antheris ellipsoideis; nuculis 5 nigrescentibus uniseriatis angulato-ovoideis 2.5–3 mm. longis rugulosis oblique basi affixis.

CHILE: Below Alto de Carmen, 80 km. from the coast in the valley east of Vallenar, prov. Atacama, lat. 28° 46′ S., long. 70° 29′ W., 800 m. alt., shrub becoming 15 dm. tall, gray with small white flowers, leaves somewhat fleshy, Nov. 1923, *Werdermann 169* (Gray Herb., TYPE; FM, BD, K).

A member of the group of *N. crassulifolia* characterized by its small corollas, slender leaves, and well developed pedicels. Its nearest relative is probably *N. albescens* which grows to the north of it, also in the region back from the coast.

42. **Nolana crassulifolia** Poeppig

Nolana crassulifolia Poeppig in Froriep, Notizen **23**: 276 (1829); Walpers, Repert. **6**: 549 (1847).—Type collected by Poeppig (no. 67) on the coast near Concon.

Nolana grossulifolia [Poeppig] Kunze ex Gay, Fl. Chile **5:** 114 (1849), lapsus.

Dolia crassifolia [Poeppig] Kuntze, Rev. Gen. **3:** 216 (1898), lapsus.

Bargemontia crassulifolia (Poeppig) Johnston, Contr. Gray Herb. **85:** 107 (1929).

Alona tomentosa Lindley, Bot. Reg. **30:** sub tab. 46 (1844).—Type-material from cliffs near Valparaiso, *Bridges* and *Cuming 481.*

Alibrexia tomentosa (Lindl.) Miers, Hooker London Jour. Bot. **4:** 508 (Oct. 1845) and Ill. So. Am. Pl. **1:** 61 (1850); Gay, Fl. Chile **5:** 114 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 17 (1852).

Dolia tomentosa (Lindl.) Bentham and Hooker, Gen Pl. **2:** 880 (1876); Reiche, Anal. Univ. Chile **125:** 504 (1910) and Fl. Chile **5:** 432 (1910).

Alibrexia rupicola Miers, Hooker London Jour. Bot. **4:** 506 (Oct. 1845) and Ill. So. Am. Pl. **1:** 59, tab. 11 (1850); Gay, Fl. Chile **5:** 114 (1849); Dunal in DeCandolle, Prodr. **13**[1]: 17 (1852).—Type collected at Concon by Miers.

Dolia rupicola (Miers) Bentham and Hooker ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b:** 4 (1891).

Dolia grandiflora Philippi, Anal. Univ. Chile **91:** 44 (1895).—Type collected by Philippi on the coast near Concon.

Chile: Along the coast near the sea from south of Valparaiso northward apparently to the port of Coquimbo, lat. 33° 35′ north to 30° S.

A prostrate shrub forming mats or draping rocks near the sea. It is well known from about Valparaiso and Concon, in fact all the four basic names of the species are founded on material from these localities. Plants, however, which seem to be referable to this species extend south at least to San Antonio, and Cartagena, and northward along the coast to the vicinity of Coquimbo. The southern collections are remarkable for their well developed pedicels, these regularly becoming 1–2 cm. long. Material from coastal rocks near Coquimbo is remarkably like this southern form, save only that its pedicels are short and only 3–5 mm. long. Werdermann (no. 886) has collected a peculiar form at Fray Jorge. This is a spreading shrub about 5 dm. tall and 10–15 dm. broad. The leaves are not spathulate as in other collections seen, but rather slender and linear, 15–25 mm. long and 1–1.5 mm. broad. The pedicels are 3–8 mm. long.

43. **Nolana incana** (Phil.), comb. nov.

Alibrexia incana Philippi, Fl. Atac. 45 (1860) and Viage Des. Atac. 18, 24, 25, 219 (1860).—Type collected near the coast at Paposo by Philippi.

Dolia incana (Phil.) Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b:** 4 (1891); Reiche, Anal. Univ. Chile **125:** 503 (1910) and Fl. Chile **5:** 431 (1910).

Dolia eremobia Philippi, Anal. Univ. Chile **91:** 45 (1895); Reiche, Anal. Univ. Chile **125:** 503 (1910) and Fl. Chile **5:** 431 (1910).—Type collected at Breas by Larrañaga.

Bargemontia eremobia (Phil.) Johnston, Contr. Gray Herb. **85:** 107 (1929).

CHILE: Along the coastal plain and somewhat into the interior in the southwestern parts of the province of Antofagasta, from about Paposo south to the Sierra Esmeralda; lat. 25° south to somewhat beyond 25° 50′ S.

SPECIMENS EXAMINED: Paposo, *Philippi* (BD, G); vicinity of Paposo, gravelly slopes and benches facing sea, forming mats or rarely low-domed masses 1–3 m. broad, corolla white, variable in size and proportions, 1925, *Johnston 5569* (G); gravelly soil near mouth of Quebrada de San Ramon near Taltal, sprawling pallid shrub 15–45 cm. tall and 6–12 dm. broad, corolla yellowish, 1925, *Johnston 5128* (G); Breas, *Larrañaga* (MS, TYPE of *D. eremobia*); Posado Hidalgos, sprawling or prostrate in dry stream-ways, corolla yellowish, 1925, *Johnston 5662* (G).

A species much resembling *N. crassulifolia* but smaller throughout. In range *N. incana* is separated from its relative by several hundred kilometers of Chilean coast. The species is also related to *N. albescens* of the Copiapó area. From that species, no doubt its closest relative, it is separated by its prostrate rather than erect habit of growth.

44. **Nolana pallida** sp. nov.

Frutex prostratus pilis minutis stellatis abundantibus incanus e radice profunda valida oriens; ramulis rigidulis 2–15 cm. longis foliosis, internodiis 2–12 mm. longis; foliis spathulatis vel oblanceolatis 6–20 mm. longis 2–3 mm. latis congestis subfasciculatis crassiusculis compressis margine valde revolutis; pedicellis ad anthesin 1–3 mm. longis ascendentibus gracilibus, fructiferis 5–9 mm. longis plus minusve recurvatis rigidiusculis; calyce ad anthesin 5 mm. longo, tubo cupulare ad 2 mm. crasso, lobis cuneatis 2–3 mm. longis ascendentibus; calyce fructifero ca. 8 mm. longo subincrassato; corolla violaceo-coerulea anguste infundibuliformi 13–15 mm. longa extus puberula, tubo 1 mm. crasso ca. 3 mm. longo, lobis calycis subaequilongis intus sparse minuteque villosulis, faucibus ca. 6 mm. longis summum ad apicem ca. 5 mm. crassis; staminibus linearibus inaequalibus 2–4 mm. longis basim versus sparse villulosis; nuculis 5 uniseriatis late basaliterque affixis 2–2.7 mm. crassis depresse angulateque globosis.

PERU: Port of Chala, dept. Arequipa, prov. Camaná, lat. 15° 50′ S.,

prostrate shrub on sandy soil in Loma Formation, 230 m. alt., flowers bluish pink with violet throat, Nov. 26, 1915, *Weberbauer 7183* (TYPE, Herb. Berol.); Atico, dept. Arequipa, lat. 16° 10′ S., flowers violet-blue, Nov. 1863, *Raimondi 10971* (BD).

A very distinct species much simulating *N. crassulifolia* and allies of Chile in its gross habit, indument, and corolla-form, but differing in its blue rather than white corolla and in its unthickened and only sparsely pubescent filament-bases.

Another collection by Ramondi (no. 9086) may belong to *N. pallida*. This was collected Oct. 1863, only a short distance from Chala, at Atiquipa. The leaves are 3–6 mm. long. The single crushed and wrinkled corolla seems to be more broadly funnelform (ca. 1 cm. broad) than in *N. pallida* described above. Ramondi describes the corolla as blue with a dark violet throat. More and better material of this plant is needed.

45. **Nolana villosa** (Phil.), comb. nov.

Alibrexia villosa Philippi, Fl. Atac. 45 (1860) and Viage Des. Atac. 16, 38, 219 (1860).—Type collected near Breadal, ca. lat. 25° 27′ S., by Philippi.

Dolia villosa (Phil.) Reiche, Anal. Univ. Chile **125**: 503 (1910) and Fl. Chile **5**: 431 (1910).

Bargemontia villosa (Phil.) Johnston, Contr. Gray Herb. **85**: 112 (1929).

? Alona dubia Philippi, Anal. Univ. Chile **27**: 350 (1865) and Anal. Univ. Chile **91**: 37 (1895).—Type collected in Quebrada de Puquios by Geisse.

CHILE: Very arid gravelly places in the provinces of Atacama and Antofagasta, chiefly back from the coast, from about Chañarcillo, lat. 27° 50′ north to Aguada de Panulcito, lat. 24° 49′ S.

In addition to the material I have previously cited of this species, l. c., there may be added *Wedermann 403* from near Tierra Amarilla, and a collection from Chañarcillo which was received at Berlin from Philippi and determined by him as *A. dubia*. The species is remarkable for its copious spongy indument of slender soft dendritic hairs. The small corollas are white or rarely pink. The relations of this species are probably with *N. leptophylla*.

46. **Nolana lycioides** sp. nov.

Frutex ca. 1 m. altus laxe rigideque ramosus; ramis gracilibus divaricato-ramosis lignescentibus; ramulis foliosis gracilibus dense stipitato-glandulosis inconspicue hispidulis 2–6 cm. longis, internodiis 1–5 mm. longis; foliis spathulatis 5–9 mm. longis 0.5–0.9 mm. latis

dense glandulosis saepe subfasciculatis ascendentibus vel divaricatis crassiusculis aliquantum compressis apice rotundis margine paullo vel vix revolutis; pedicellis 3–8 mm. longis gracillimis, fructiferis paullo accrescentibus ut videtur ascendentibus; calyce dense glandulifero ad anthesin 4 mm. longo in lobos cuneatos inaequales 2–3 mm. longos ascendentes usque ad 1 mm. supra basim dissecto, fructifero 6–7 mm. longo; corolla caerulea infundibuliformi 2.2–2.7 cm. longa extus sparse glandulosa et puberulenta intus in tubo minute puberulenta, tubo gracillimo 8(–10) mm. longo minus quam 1 mm. crasso calyce 2–3-plo longiori, faucibus abrupte ampliatis 10–12 mm. diametro, lobis ascendentibus rotundis 6–7 mm. latis 3–4 mm. longis sinibus clausis, limbo 18–20 mm. diametro; filamentis inaequalibus linearibus glabris summum ad apicem tubi affixis 5–7 mm. longis; nuculis 5–8 uniseriatis, maturis ignotis.

PERU: Gravelly places in the Loma Formation near Mollendo, Dept. Arequipa, lat. 17° S., 300 m. alt., shrub a meter high with bright blue corollas, Oct. 4, 1902, *Weberbauer 1517* (TYPE, Herb. Berol.)

A very distinct and well marked species characterized by its large corollas with very elongate and very slender tube and broad throat and limb, its slender pedicels, its small crowded very glandular leaves, and its slender but distinctly lignescent stiffish twiggy stems. The loosely branched habit of this plant is suggestive of a slender species of *Lycium*.

47. **Nolana deflexa** (Johnston), comb. nov.

Bargemontia deflexa Johnston, Contr. Gray Herb. **85**: 110 (1929).—Type collected at Carrizalillo by Harding.

CHILE: Known only from Carrizalillo, northern Atacama, a locality lying in lat. 26° S. and over 35 km. inland.

This species is evidently related to *N. clivicola* and *N. ramosissima* but quickly separated from them by its strongly deflexed fruiting pedicels, less slender proportionately stouter corollas, and very slender linear leaves. It further differs in being a species of the very arid country back from the coast and not of the hills along the sea. It occurs to the south of the two species mentioned.

48. **Nolana ramosissima** sp. nov.

Frutex densus globosus 9–16 dm. altus foliosissimus; ramulis numerosissimis gracilibus laxe ramosis cortice pallido obtectis pilis brevibus inconspicuis erectis simplicibus glanduliferis abundanter ornatis, internodiis 1–10 mm. longis; foliis abundantibus succulentis linearibus vel anguste spathulatis 5–13 mm. longis 0.5–1.1 mm. latis erectis vel ascendentibus glandulari-puberulentis apice rotundis margine leviter vel vix revolutis, costa vix evidente; floribus in axillis

solitariis; pedicellis fructiferis 1–5 mm. longis erectis vel ascendentibus haud recurvatis; calycibus ad anthesin 8–10 mm. longis glanduloso-puberulentis, tubo cupulari 1.5–2 mm. longo ca. 2 mm. crasso, lobis linearibus erectis paullo inaequalibus; corolla azurea ca. 13 mm. longa extus pilis inconspicuis glanduliferis ornata intus basim versus inconspicue minutissimeque subglandulo-pubescente, tubo ca. 9 mm. longo infra medium 1 mm. crasso supra medium 1–1.5 mm. crasso lobis calycis subaequilongo, limbo ca. 7 mm. diametro infundibuliformi faucibus vix distincta lobis ascendentibus; filamentis inaequalibus filiformibus glabris 3–4 mm. supra basim corollae affixis; receptaculo lobato; nuculis 3–8 ellipsoidalibus vel ovoideis 2–3 mm. longis nigris ut videtur glutinosis.

Dolia salsoloides sensu auct.; Gaudichaud, Bot. Voyage Bonite, Atlas tab. 113 (1851–52); Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 24, 25, 218 (1860); Reiche, Anal. Univ. Chile **125**: 505 (1910) and Fl Chile **5**: 433 (1910).

Bargemontia salsoloides sensu Johnston, Contr. Gray Herb. **85**: 111 (1929).

CHILE: Coastal hills of the prov. Antofagasta; near Taltal, Paposo and probably Cobija, lat. 25° 25′ to 22° 30′ S.

SPECIMENS EXAMINED: Paposo, *Philippi* (BD); about dry rocky slope at mouth of Quebrada de Guanillo near Paposo, a dense succulent globose bush 9–12 dm. tall, flowers blue, Dec. 8, 1925, *Johnston 5590* (TYPE, Gray Herb.); rocky seaward slope at mouth of Quebrada de San Ramon near Taltal, a light green succulent bush 10–16 dm. tall, corolla light blue, Nov. 28, 1925, *Johnston 5167* (G).

A species closely related to *N. clivicola* but differing in being more succulent, less glandular, and more abundantly and densely branched. It is a dense globose bush with the leaves narrower, more juicy and of a lighter green than in its relative. Philippi collected this species at Paposo in December 1853 and determined it as *Dolia salsoloides*. This determination was subsequently accepted by Reiche. My collections of this plant came from the same area as Philippi's and were compared with them at Santiago. They were described under the name *B. salsoloides*. A recent study of the type of *Dolia salsoloides* Lindl., however, proves that plant to be a very different species. The present plant, which has been misdetermined in the writings of Philippi, Reiche and Johnston, is accordingly being described as a new species.

At present *N. ramosissima* is with certainty known only from Paposo and Taltal. Gaudichaud, l. c., however, has illustrated a plant which may represent our species, though the corolla-tube is shown more exserted and the calyx-tube much more developed than in any mate-

rial I have seen. The details on Gaudichaud's plates, unfortunately, are frequently incorrect. I have seen no material in Europe which could possibly form the basis for this plate. I can only suggest that it may represent material collected by Gaudichaud at Cobija and that specimens should be looked for in the Webb Herbarium at Florence.

49. **Nolana clivicola** (Johnston), comb. nov.

Bargemontia clivicola Johnston, Contr. Gray Herb. **85**: 157 (1929).—Type from the hills near Tocopilla, *Johnston 6307*.

CHILE: Known only from the slopes above Tocopilla, prov. Antofagasta, ca. lat. 22° S.

SPECIMENS EXAMINED: Bush on rocky slope in Cereus-belt, Tocopilla, Oct. 18, 1925, *Johnston 6307* (G, TYPE); Tocopilla, 1930, *Jaffuel 1031* and *1032* (G).

Although described as having the corollas glabrous inside, a reëxamination of the type shows that the corolla-tube is minutely pubescent towards the base within.

50. **Nolana inconspicua** (Johnston), comb. nov.

Bargemontia inconspicua Johnston, Contr. Gray Herb. **85**: 158 (1929).—Type collected near Antofagasta, *Rose 19416*.

CHILE: Along the coastal hills of the province of Antofagasta, from Tocopilla to Antofagasta, lat. 22° south to 23° 40′ S.

SPECIMENS EXAMINED: Vicinity of Antofagasta, Oct. 31, 1914, *Rose 19416* (US, TYPE; NY); Cobija, *Gaudichaud* (Paris); coastal hills near Tocopilla, spreading shrub 3 dm. tall, corolla blue, Aug. 10, 1925, *Berninger 441* (BD); Tocopilla, Oct. 27, 1930, *Jaffuel 1016* (G).

The collections of Berninger and Jaffuel indicate that the corollas of this species may be as large as those in *N. leptophylla*. While I am unable to give satisfactory key-characters for the separation of *N. inconspicua* and *N. leptophylla* I am convinced that better and more ample collections of these two species will prove them amply distinct. The present plant seems to be a weaker less shrubby one than *N. leptophylla* and to have larger, more elongate, thinner leaves and a denser pubescence.

51. **Nolana leptophylla** (Miers), comb. nov.

Dolia leptophylla Miers, Hooker London Jour. Bot. **4**: 504 (Sept. 1845) and Ill. So. Am. Pl. **1**: 57 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 16 (1852).—Type given as from Peru, *Cuming 956*, but almost certainly from Cobija.

Bargemontia leptophylla (Miers) Johnston Contr. Gray Herb. **85**: 159 (1929).

Velpeaulia alibrexioides Gaudichaud, Bot. Voyage Bonite, Atlas tab. 109 (1851–52).—Type collected at Cobija by Gaudichaud.

Bargemontia alibrexioides (Gaud.) Johnston, Contr. Gray Herb. **85:** 159 (1929).

Alona deserticola Philippi, Fl. Atac. 44 (1860) and Viage Des. Atac. 89, 218 (1860); Reiche, Anal. Univ. Chile **125:** 500 (1910) and Fl. Chile **5:** 428 (1910).—Type material collected by Philippi at Chaco (3100 m. alt.), lat. 25° 15′ S., and Chañaral bajo (1500 m. alt.), lat. 26° 36′ S.

Bargemontia deserticola (Phil.) Johnston, Contr. Gray Herb. **85:** 111 (1929).

CHILE: Dry gravels, mostly in the interior, of the provinces of Antofagasta and Atacama, lat. 22° 30′ south to 27° 10′ S.

MATERIAL EXAMINED: Cobija, July 1836, *Gaudichaud 6* (Paris); "Cobija, Iquiqui et Arica." 1831, *Cuming 956* (K, TYPE); Atacama, *Philippi* as *A. deserticola* (BD); Quebrada de Pasto Cerrado near Potrerillos, prostrate perennial on dry gravelly bench, corolla slightly bluish, 2100 m. alt., Oct. 1925, *Johnston 3663* (G, K); between Puquios and La Puerta, Quebrada de Puquios, Cord. Maricanga, flowers bluish, 1500 m. alt., Oct. 1924, *Werdermann 454* (G, BD).

The type of *N. leptophylla* is *Cuming 956* in the Hooker collections at Kew. It was labeled by Hooker as from Peru but according to a manuscript plant-list at the British Museum and to one of Cuming's original labels which is associated with this same number in the Bentham collections at Kew, it is clear that the specimen belongs to a suite of numbers that Cuming distributed as from "Cobija, Iquiqui et Arica." The type no doubt came from Cobija.

The type of *Velpeaulia alibrexioides*, as shown by specimens at Paris, is in all probability Gaudichaud no. 6 from Cobija. This specimen in its rigid branching, thick strongly revolute leaves, and stiff glandular hairs gives every evidence of having grown in an extremely arid situation. The type of *N. leptophylla*, which I believe we may accept as having been also collected at Cobija, is a much more slender plant with much longer and much more slender hairs. The differences between the two types, I am convinced, are ecological in origin. Cuming's plant is very much like the more southerly plants from the interior, along the base of the cordilleras, which Philippi has described as *Alona deserticola*.

Werdermann's material (no. 454) from between Puquios and La Puerta is notable for having some forked hairs intermixed with the simple hairs forming the mass of its indument. Typically *N. leptophylla* has entirely simple hairs. Werdermann's specimen, as well as similarities in the shape of the revolute leaves found between *N.*

leptophylla and *N. villosa*, makes me feel that these two species are immediately related. Both are plants inhabiting the arid crests (above the fog-bathed fertile slopes) of the coastal hills as well as the desert interior. Except for the collections near Cobija, which may have come from the arid crests of the coastal hills at 1000 m. or over, *Nolana leptophylla* is known only from the very arid interior, 75–125 km. from the coast and at altitudes from 1500 m. to over 3000 m.

52. **Nolana sedifolia** Poeppig

Nolana sedifolia Poeppig in Froriep, Notizen **23:** 276 (1829).—Type collected on the coast at Concon by Poeppig, no. 68.

Bargemontia sedifolia (Poepp.) Johnston, Contr. Gray Herb. **85:** 110 (1929).

Fabiana lanuginosa Hooker and Arnott, Bot. Beechey Voyage 35 (1830); Miers, Hooker London Jour. Bot. **5:** 164 (1846) and Ill. So. Am. Pl. **1:** 88 (1850).—Type from Coquimbo.

Salsola glomerulata Meyen, Reise **1:** 375 (1834).—Type collected by Meyen near the Port of Copiapó.

Dolia vermiculata Lindley, Bot. Reg. **30:** sub tab. 46 (1844); Miers, Hooker London Jour. Bot. **4:** 502 (Sept. 1845) and Ill. So. Am. Pl. **1:** 55, t. 12 (1850); Gay, Fl. Chile **5:** 108 (1849); Gaudichaud, Bot. Voyage Bonite, Atlas tab. 112 (1851–52); Dunal in DeCandolle, Prodr. **13**[1]: 15 (1852); Reiche, Anal. Univ. Chile **125:** 502 (1910) and Fl. Chile **5:** 430 (1910).—Type-material cited as "Coquimbo, (herb. Cuming, 893; Bridges, 1336)"; Bridges collections came from between Huasco and Coquimbo!

Dolia verticillata Miers ex Walpers, Anal. **1:** 523 (1848–49), lapsus calami.

Alibrexia brevifolia Philippi, Linnaea **33:** 208 (1864).—Type collected by Landbeck on rocks near sea at Los Molles.

Dolia brevifolia (Phil.) Philippi ex Wettstein in Engler and Prantl, Nat. Pflanzenfam. iv. **3b:** 4, fig. 1 (1891).

Alibrexia breviflora Philippi ex Johnston, Contr. Gray Herb. **85:** 107 (1929), lapsus calami.

CHILE: Dry rocky places near the sea from the vicinity of Valparaiso north to Iquique, lat. 33° to 20° 13′ S.

A very well marked species forming a shrub 5–12 dm. tall. The corolla is white. The small fleshy leaves are glabrous or nearly so above, but are villous-tomentose beneath on the parts not covered by the strongly revolute margins. The only species readily confused with *N. sedifolia* is *N. diffusa*, a local species occurring in the coastal area with *N. sedifolia* in the northernmost parts of its range. *Nolana diffusa*, however, is a low spreading plant with bluish corollas, a looser sordid tomentum and narrower tomentose leaves. The re-

markably extended range of *N. sedifolia*, between Valparaiso and Iquique is well substantiated by numerous collections.

With the exception of Philippi's *Alibrexia brevifolia* the type of all the species cited above have been examined. The original collection of *Salsola glomerulata*, unrecognized since it was described in 1834, was found among the undetermined Chenopodiaceae at Berlin. It is a weathered and sterile specimen of the present plant! According to the label it was collected April 18, 1831 at "Copiapo." The original publication of the species makes it clear, however, that it was found in the immediate vicinity of the old port of Copiapó (a few kilometers to the south of Caldera) and must have been collected in March 1831.

When Lindley described *D. vermiculata* he cited two specimens, giving both as from Coquimbo, first, *Cuming 893*, and second, *Bridges 1336*. The Cuming specimen may be accepted as from Coquimbo for the species has been collected by numerous other botanists in that locality. Bridges' material, however, did not come from Coquimbo. Lindley gives the number of the Bridges collection as 1336. This is clearly an error for 1330! Bridges' no. 1336 belongs with a specimen of *Dondia multiflora* Phil. from salt marshes near Huasco and Copiapó. In Bridges' manuscript plant-list at the British Museum his no. 1330 is accompanied by an unpublished name suggesting the similarity of the plant with *Fabiana*, and by data indicating that it was a white-flowered shrub, 3–9 dm. tall, growing near the coast between Huasco and Coquimbo. It is obvious that this data fits *N. sedifolia* and that it is quite inapplicable to any other one of the nine Nolanaceae collected by Bridges. In the Hooker collections at Kew the species appears under Bridges' number 1331 and is labeled as from Concepcion. The geographic data is clearly false. Bridges' plant-list shows that no. 1331 belongs to a *Phrodus*. At Paris *N. sedifolia* occurs under its proper number, i. e. 1330. Miers, Ill. So. Am. Pl. **2**: 25, adnot. (1857), has given a discussion of this confusion among Bridges' numbers and has also accepted *Bridges 1330* as the proper designation for the cotype of Lindley's species.

The original description of *A. brevifolia* seems to indicate the present species. It seems significant also that Wettstein has bracketed it with *D. vermiculata* and that material of *N. sedifolia* from Valparaiso area has been distributed from Santiago under Philippi's binomial. It becomes very perplexing, therefore, to note that Reiche, Fl. Chile **5**: 431 (1910), treats *A. brevifolia* as a synonym of *Dolia incana*, one of the stellate-tomentose species belonging to the group of *N. crassulifolia*.

53. **Nolana diffusa** sp. nov.

Planta fruticosa depressa 5–15 cm. alta 30–90 cm. lata ramosissima; ramulis gracilibus 3–15 cm. longis 1–2 mm. crassis plus minusve glandulosis pilis gracilibus 1–2 mm. longis indumentum laxissime tomentosum formantibus vestitis, internodiis 2–4(–6) mm. longis; foliis numerosissimis oblongis vel spathulato-oblongis 2–4 mm. longis 1–1.5 mm. latis succulentis ascendentibus vel divaricatis non rariter suboppositis sparse glandulosis pilis longis flexuosis vestitis; foliis juventate (in axillis foliorum et apicem versus ramulorum) fasciculos densos conspicue tomentosos formantibus; pedicellis 1–3 mm. longis laxe sparseque tomentosis ascendentibus maturitate recurvatis; calycibus ad anthesin 3–4 mm. longis 2 mm. crassis usque ad medium lobatis, lobis crassis oblongis vel oblongo-lanceolatis pilis flexuosis vestitis; calycibus fructiferis 5 mm. crassis; corolla coerulescente saepissime ca. 6 mm. longa quam calyce duplo longiore (rariter ad 10 mm. longa et quam calyce triplo longiore), tubo intus basim versus sparse villosulo, limbo 5–6 mm. diametro; filamentis linearibus inaequalibus 3–5 mm. longis; nuculis uniseriatis 3–7 plus minusve globosis ca. 2 mm. diametro nigris minute tuberculatis anguste irregulariterque rugulosis.

CHILE: Very arid gravels on the high crests and along the dry bases of the coastal hills of the province of Antofagasta (Caleta Encalada, Miguel Diaz, Paposo and Taltal), lat. 24° 23′ to 25° 25′ S.

SPECIMENS EXAMINED: Caleta Encalada, June 1923, *Harding* (G); dry crests well above the fertile belt, Aguada de Miguel Diaz, forming depressed mats 3–9 dm. broad and 5–15 cm. high, corolla lavender, Dec. 1925, *Johnston 5384* (TYPE, Gray Herb.); gravelly coastal plain, Paposo, prostrate 3–6 dm. broad and 6–15 cm. high, corolla pale bluish, Dec. 1925, *Johnston 5570* (G); Taltal, Nov. 1930, *Jaffal 960* (G).

A species related to *N. tocopillensis* but differing in its smaller corollas, smaller more congested much less glandular leaves, and very much more dense and branched habit. In another paper, Contr. Gray Herb. **85:** 110 (1929), I have treated the plant as a form of *N. sedifolia*. The colored corollas, the narrower tomentose leaves, and the sordid tomentum, however, readily separates *N. diffusa* from the erectly growing much more shrubby *N. sedifolia*.

54. **Nolana foliosa** (Phil.), comb. nov.

Dolia foliosa Philippi, Cat. Pl. Itin. Tarapaca 68 (1891); Reiche, Anal. Univ. Chile **125:** 504 (1910) and Fl. Chile **5:** 432 (1910).—Type collected between Mocha and Guaviña by Rahmer in March 1885.

Bargemontia foliosa (Phil.) Johnston, Contr. Gray Herb. 85: 111 (1929).

CHILE: Known only from the Quebrada de Tarapacá between Mocha and Guaviña, 2000–2500 m. alt., ca. lat. 19° 48′ S. and long. 69° 15′ W., in the province of Tarapacá about a 100 km. inland.

I have studied specimens at Washington, Kew and Berlin which were received from Philippi. These collections, obviously part of a single gathering, were received as "*Dolia foliosa* Phil." and given as from "Tarapacá." More and better collections of the species are needed, however, before its relations can be satisfactorily determined. The isotypic material examined suggests affinities with *N. confinis* and *N. tocopillensis*. The branching is rather regularly dichotomous. The corolla is smaller, the leaves are less densely fasciculate, and the stems are less evidently nodose than in the species mentioned. Some of the glabrescent forms of *N. confinis* seem to approach *N. foliosa* rather closely. Both *N. foliosa* and *N. confinis* are species of the interior.

55. **Nolana tocopillensis** (Johnston), comb. nov.

Bargemontia tocopillensis Johnston, Contr. Gray Herb. **85:** 158 (1929).—Type collected on a hillside near Tocopilla, *Johnston 3603*.

CHILE: Coastal hills in northwestern part of the province of Antofagasta, lat. 21° 25′ south to 22° 30′ S.

SPECIMENS EXAMINED: Sobre los Cerros de los Paredones en las orillas de "Loa," lat. 21° 25′ S., *Raimondi 10285* (BD); Tocopilla, Oct. 1930, *Jaffuel 1022* (G); slopes in the fertile belt near Tocopilla, Oct. 1925, *Johnston 3603* (G, TYPE); Cobija, *Gaudichaud 4* and *5* (Paris).

The leaves are glandular and are somewhat thickened at the attachment. They are spreading and slightly recurved beyond the middle or the whole leaf in lateral outline may present a characteristic flattened sigmoid curve.

56. **Nolana confinis** (Johnston), comb. nov.

Bargemontia confinis Johnston, Contr. Gray Herb. **85:** 176 (1929).—Type collected at Candarave, *Weberbauer 7382*.

PERU: Base of the cordilleras in the department of Tacna, 30–125 km. inland, 500–4000 m. alt., lat. 17° to 18° S.

SPECIMENS EXAMINED: On bare sandy hills near Tacna, 800–900 m. alt., 1891–1892, *Woitschach* (BD); a single plant on bank of nearly dry stream-way near Tacna, 650 m. alt., corolla bluish, Aug. 1925, *Werdermann 720* (G, BD, FM); sand in stream-way near Tacna, corolla sky-blue, 1891, *Woitschach* (BD); dry hills, Tacna, plant prostrate, Sept. 1864, *Pearce* (K, BM); with scattered herbs and

Cereus, Candarave, 4000 m. alt., corolla violet, March 1925, *Weberbauer 7382* (FM, TYPE; G, BD); ? Altos de Sitana near Valle de Locumba, 1500 m. alt., on sand, *Woitschach* (BD).

The fruit of this species consists of 5 more or less roughened and angulate nutlets. These are affixed on a low but distinct pyramidal gynobase which occupies most of the receptacle. The type-collection of *N. confinis* is undoubtedly a perennial plant. Other collections, however, appear to be small herbaceous annuals. The plants probably flower the first year, and, when conditions are favorable, develop the more or less persistent root and shrubby base that is to be observed in various degrees of development among the specimens before me. The small leaves are fasciculate and usually more or less embedded in a floc of wooly hairs. These characters suggest relations with *N. sedifolia*, *N. diffusa* and *N. tocopillensis*. The specimens I have cited from the Altos de Sitana are peculiar in having an indument of numerous minute curved hairs. They do not have the characteristic tomentum of good *N. confinis*. In addition the leaves are several millimeters broad and are not distinctly fasciculate. The specimens are left in *N. confinis* somewhat doubtfully. They probably represent an undescribed species.

57. **Nolana pilosa** sp. nov.

Suffrutex diffusus, partibus junioribus sparse glandulosis pilis simplicibus mollibus flexuosis 1–2 mm. longis ornatis pilosis vel subtomentosis; partibus maturis non rariter plus minusve subglabratis; caulibus prostratis vel laxe decumbentibus e radice recta per paucos annos persistente orientibus laxe ramosis 1–10 dm. longis gracilibus 1.5–3 mm. crassis, internodiis 0.5–6 cm. longis; foliis valde compressis 1–2.7 cm. longis 1–6(–8) mm. latis saepissime oblanceolatis vel sublinearibus (vetustioribus non rariter late affixis et oblanceolato-oblongis) apicem versus latioribus basim versus in petiolum gracilem gradatim attenuatis margine revolutis apice obtusis vel rotundis; pedicellis ad anthesin 5–15 mm. longis ascendentibus, fructiferis recurvatis incrassatis sed paullo longioribus; calyce ad anthesin 6–8 mm. longo, tubo cupulato, lobis erectis inaequalibus cuneatis 4–6 mm. longis 1–2 mm. latis; corolla azurea infundibuliformi 13–22 mm. longa, quam tubo calycis breviore intus minute puberulento, limbo 12–22 mm. diametro, lobis ascendentibus rotundis; staminibus inaequalibus 5–8 mm. longis; nuculis 4–8 uniseriatis inaequalibus depresse globosis rugulosis angulatis 2–2.5 mm. crassis.

PERU: Known only from the coastal hills in the region about Mollendo, dept. Arequipa, lat. 17° S.

SPECIMEN EXAMINED: Mollendo, dept. Arequipa, in dry gravel at

lower edge of the Loma Formation, 20–100 m. alt., flowers sky-blue, Oct. 2, 1902, *Weberbauer 1485* (BD); Mollendo, dry gravel at lower edge of the Loma Formation, 100–200 m. alt., flower bluish, Oct. 8, 1902, *Weberbauer 1556* (BD); Mollendo, *Safford K. 65* (K); Mejia near Mollendo, 50 m. alt., Nov. 16, 1923, *Guenther and Buchtien 117* (TYPE, Hamburg); Mejia, 40 m. alt., Oct. 27, 1923, *Guenther and Buchtien 119* (Hamb.); Cachendo, east of Mollendo, 1000 m. alt., Nov. 27, 1923, *Guenther and Buchtien 118* (Hamb.); Cachendo, 1000 m. alt., Oct. 15, 1923, *Guenther and Buchtien 122* (Hamb.).

A loosely branched prostrate plant with stems becoming almost a meter long. It is distinctly coarser than *N. confinis* having larger broader leaves, larger and broader corollas, and less entangled hairs in its indument. As is the case with *N. confinis* it may flower the first year and so appear to be annual. It frequently does persist, however, and produce a thickened root that probably lasts a number of years. In what I consider the typical form, the pilosity is more or less distinctly spreading. In *Weberbauer 1556* from Mollendo and *Guenther and Buchtien 118* from Cachendo, the pilosity is dense and appressed on the leaves thus making them tomentose. These two collections, however, are obvious xerophytes and very much less thrifty than the plants having the typical spreading pilosity described. The difference I believe is ecological in origin. The four collections by Guenther and Buchtien (nos. 117, 118, 119 and 122) are the basis upon which Bruns, Mitt. Inst. Bot. Hamburg **8**: 71 (1929), reports *Alona coelestis*, *A. deserticola*, *A. xerophila* and *Dolia tarapacana* from the Peruvian littoral.

QUESTIONABLE AND EXCLUDED SPECIES

Alona microphylla Miers, Hooker London Jour. Bot. **4**: 501 (Sept. 1845) and Ill. So. Am. Pl. **1**: 54 (1850); Gay, Fl. Chile **5**: 112 (1849). *Nolana microphylla* Miers ex Dunal in DeCandolle, Prodr. **13**[1]: 15 (1852).

As indicated by Reiche, Fl. Chile **5**: 320 (1910), this is the Solanaceous *Phrodus microphyllus* Miers, Ann. and Mag. Nat. Hist. ser. 2, **4**: 33 (1849) and Ill. So. Am. Pl. **2**: 24, tab. 42 (1857). It was originally given as based upon *Bridges 1330* from Concepcion, in southern Chile, but as Miers later suggested all this data is incorrect. A study of Bridges' plant-list shows conclusively that this *Phrodus* should bear the number *1331* and that it was collected in a dry valley between Huasco and Copiapó in the province of Atacama. It is given by Bridges as being a shrub 2–3 ft. high and as having white flowers.

Nolana fruticosa Young, Hort. Epsom. **1**: 34 (1828), nomen.

This name appears without any descriptive matter in the above cited list. Loudon, Gard. Mag. **5**: 471 (1829), attributes the name to George Penny who was gardener at the Young's Epsom Nursery but whose name is not mentioned in the Hortus Epsomensis, and gives the following data regarding the species. "Nolana (L.) fruticosa Penny in Hort. Eps. p. 34 (tenella Lindl. Hort. Trans. vol. vii. part ii. p. 252) Mr. Lindley erroneously considers this plant an annual. It has remained perfectly shrubby, for several years, in a greenhouse, to which it is no common ornament: hence I have retained the above original and expressive name."

Nolana revoluta Ruiz and Pavon, Fl. Peruv. et Chile. **2**: 8, tab. 113b (1799); G. Don, Gen. Syst. **4**: 479 (1837). *Alona revoluta* (R. and P.) Lindley, Bot. Reg. **30**: sub tab. 46 (1844); as to name only. *Alibrexia revoluta* (R. and P.) Miers, Hooker London Jour. Bot. **4**: 508 (Oct. 1845) and Ill. So. Am. Pl. **1**: 61 (1850); Dunal in DeCandolle, Prodr. **13**[1]: 17 (1852); as to name only. *Dolia revoluta* (R. and P.) Bentham and Hooker, Gen. Pl. **2**: 880 (1876). *Nolana conferta* Ruiz and Pavon, Fl. Peruv. et Chile. **2**: 7 (1799).

This plant is based upon a plate, the identification of which remains doubtful. The source and basis of the species is given as "arenosis locis ad Camanae Provinciam, unde Tafalla iconem nobis misit." Miers identified the species with the plant from about Lima which I am treating as *N. Gayana*. That plant however, differs in habit of growth, shape and lack of veining of the leaves, long pedicels, etc. The only other Peruvian plant at all suggestive of *N. revoluta* is the one I am describing as *N. pallida*, which incidentally does come from the province of Camaná, but that plant differs in shape of corolla, the very different calyx, its strong perennial root, very woody stems, not evidently veined leaves, etc. Both *N. Gayana* and *N. pallida* have a dense felt-like indument of stellate hairs. *Nolana inflata* is described and illustrated as glabrous. After puzzling over this species for many months I have come to believe that the plant either has not been recollected or represents a non-Nolaneaceous plant.

Nolana tenella Lindley, Trans. Hort. Soc. London **7**: 252 (1828); G. Don. Gen. Syst. **4**: 479, fig. 43 (1837); Dunal in DeCandolle, Prodr. **13**[1]: 10 (1852); Saunders, Jour. Genetics **29**: 387–419, tab. 33–36 (1934). *? Nolana paradoxa* var. *violacea* hort., l'Hort. franç. **1859**: 60, tab. 6 (1859), not Van Houtte (1858).

This species is of garden origin and apparently a chance hybrid of *N. humifusa* of Peru and *N. paradoxa* of Chile. It was originally described by Lindley from material "Presented to the [London Horticultural] Society, in 1824, by Robert Barclay, Esq. by whom

it was raised from Chilian seeds." It is said to have flowered in the garden of the Society at Chiswick in August, 1825. Lindley's paper concerning it was read in September 1827 and published the following year. Of *N. tenella* I have studied material in the Bentham collections at Kew labelled, "*Nolana tenella*, Hort. Barclay 15-7-30" and quite similar collections at Geneva labeled "*Nolana tenella*, du Perou, Jardin de M. Barclay, Juill. 1830, M. Alphonse DC." These two collections agree closely with the original description and are, I believe, authentic representatives of the species. They are evidently hairy, especially on the stems, petioles and pedicels where the slimy spreading hairs are at least one millimeter long. Other material that I am content to refer to *N. tenella* is practically glabrous. This is the condition in the specimens at Washington distributed from St. Petersburg garden as this species, and in the material at the Gray Herbarium which was grown in the Harvard gardens in 1865 (as *N. prostrata*).

When he described *N. tenella*, Lindley remarked "This very pretty species has been confounded in the Botanical Magazine, tab. 2604 with my *Nolana paradoxa*, an extremely curious and widely different plant." This ambiguous remark by Lindley has resulted in much confusion. The plant illustrated on plate 2604 (as I have fully discussed under *N. paradoxa*) is characteristic *Nolana paradoxa* of Chile and not representative of *N. tenella* as so many authors have supposed. Only the observations in the text accompanying this plate apply to *N. tenella!* Very significant is the following final paragraph in the Botanical Magazine, "Our drawings were taken at the collection of the late John Walker, Esq. in May, 1823, where it was raised from seeds, imported from Chili, by Mr. Francis Place [who had also imported the seeds from which the type of *N. paradoxa* was grown]. But we had no opportunity of examining the plant particularly, and comparing it with *prostrata*, till we received specimens of both species from Bury Hill in August [1824] last." It is to be noted that Bury Hill was the estate of Robert Barclay and the place from which the Chiswick plants described by Lindley as *N. tenella* were also obtained. What is more, the material studied by Lindley and by the editor of the Botanical Magazine seems to be part of the same distribution, for both authors mention August 1824 as the date upon which their material from Barclay's garden came to hand. The material from Barclay grown in the Chiswick gardens was described as *N. tenella* by Lindley. That received by the editor of the Botanical Magazine was misidentified with *N. paradoxa*, associated with a plate of that species, and discussed at length in the text where it was compared with *N. prostrata* of Peru.

The status of *N. tenella* has recently been well established through breeding experiments conducted by Saunders, Jour. Genetics **29**: 387–419 (1934). She has demonstrated that it is "not a species but the F_1 hybrid between prostrata ♀ and atriplicifolia ♂" and has given some excellent colored plates showing the parents as well as the hybrid. Her *N. atriplicifolia* I consider to be a form of *N. paradoxa* Lindl. *Nolana prostrata* is a synonym of *N. humifusa*. Miss Saunders believes *N. tenella* to be a natural hybrid. As I have discussed under *N. paradoxa*, however, the distribution of the two parents is such that a wild hybrid is out of the question. *Nolana tenella* must have had a garden origin.

Osteocarpus ? elegans Philippi, Anal. Univ. Chile **91**: 38 (1895).

This name is mentioned in the discussion following the original description of *Alona ? grandiflora* (which appears to be a synonym of *Alona carnosa* Lindl.) as follows (translated). "The plant which most approximates it, is *Osteocarpus ? elegans*, from which *A. ? grandiflora* differs in having the stems and leaves coarser, the calyx twice as large, and the younger parts covered with abundant varnish." Possibly Philippi was referring to some form of *Alona rostrata*. Reiche, in his Flora de Chile, makes no mention of the name.

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